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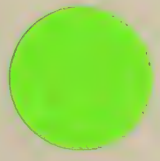
ASSESSING MEDICARE HOSPITAL PAYMENT LEVELS



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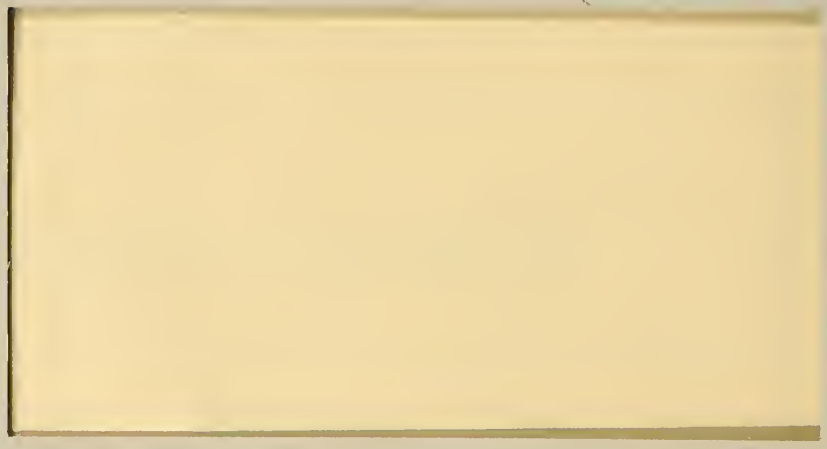

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ASSESSING MEDICARE HOSPITAL PAYMENT LEVELS

1.0 INTRODUCTION

1.1 Purpose of the Study

The PPS standardized amounts that are published annually by HCFA in the Federal Register form the basis of Medicare payments to hospitals. These amounts are based on 1982-83 hospital average costs that have been trended forward using the PPS update factors. As averages, they contain the costs of both efficient and inefficient hospitals in the base period. It is believed that cost-based reimbursement permitted a great deal of inefficiency, assuming that the majority of hospitals were not cost-minimizers (or profit maximizers).

The standardized amounts have been updated now for many years using the HCFA market basket of input prices as a starting point and adjusting upwards or downwards in response to industry performance. With the exception of rural hospitals in 1990 and 1991, annual updates have been below the market basket, and hospital costs in general have exceeded the updates by several percentage points each year. Cost inflation so much above input price inflation has renewed concerns that inefficient behaviors have not been entirely eliminated from hospital management. On the other hand, now that PPS margins have turned negative, pressures are building to raise the update factors.

The general purpose of this study is to review current methods for updating PPS rates and, after evaluating the evidence on hospital performance through the first five years of prospective payment, to consider ways of incorporating the performance of efficient hospitals explicitly into the update methodology.

1.2 Scope of the Study

The report is in six chapters including the Introduction. Chapter 2 is a summary and critique of the current method used by HCFA to update the PPS rates. It focuses on the failure

to adequately measure within-DRG casemix, the problems in measuring the cost contribution of new technologies and productivity, and how to value hospital outputs.

Chapter 3 discusses the role PPS margins play in setting the updates. The chapter begins with the economic rationale for PPS and the expected cost competition that disappeared after the first couple of years. Empirical data are then provided on trends in PPS and total margins and the growing inequality in financial performance in the system. The chapter continues with a discussion of the meaning of profits in a primarily "nonprofit" industry and the implications of profit targetting (vs. maximization) for cost performance. Several flaws in the accounting and interpretation of PPS and total margins are provided next, and the chapter concludes with a theoretical argument against the common notion that Medicare is being cross-subsidized by other payers.

Chapter 4 provides extensive information on the structural and performance characteristics of consistent PPS financial winners and losers. After first defining consistent performance groups, trends in margins and the variables correlated with the likelihood of being a winner or loser are presented. The drastic volume declines among losers is documented next. Cost and productivity comparisons of winners vs. losers is provided in the concluding sections of the chapter.

Chapter 5 turns Chapter 4 on its head by identifying two reference sets of "efficient, low cost" hospitals and then examining their financial performance. One reference set is based on casemix and wage-adjusted Medicare costs nationwide while a second set uses regression methods to further control for bedsize, urban-rural location, and teaching status, thereby creating a "peer group" set of efficient hospitals. The structural, financial, volume, cost, and productivity characteristics of each group are then presented. Also included are several tables that make individual hospital comparisons of low and high cost groups within the same state and urban-rural location. The chapter concludes with an empirical explanation of why low cost hospitals appear to be so underutilized.

Chapter 6 of the report summarizes the research and provides conclusions regarding the potential for identifying a reference set of efficient hospitals to guide in the setting of future PPS updates.

2.0 SUMMARY AND CRITIQUE OF HCFA/OACT APPROACH TO PPS UPDATES

2.1 Summary of HCFA Approach to PPS Updates

The underlying components of the PPS update have included:

- the forecasted market basket change in input prices;
- an estimate of within-DRG casemix increase;
- an estimate of the costliness of new science and technologies;

as well as two offsets for:

- productivity improvements; and
- improved practice patterns.

These components can be categorized into three groups:

(1) a positive allowance for input price inflation beyond the hospital's control;

(2) an allowance for justifiable increases in intensity of care;

(3) a negative adjustment for productivity gains in treating inpatients.

HCFA/OACT and ProPAC have used hospital industry data to quantify casemix and technology cost increases. ProPAC has also relied on AHA data to estimate productivity gains while HCFA/OACT has relied on an economy-wide productivity indicator as a normative goal. The purpose of all these additions to the market basket is to either (a) isolate the justifiable increase in intensity; or (b) introduce productivity offsets which are not automatically reflected in the standardized amounts. (In a price competitive market, of course, next year's prices would reflect productivity gains.)

We argue in this chapter that inspection of prior year hospital industry performance provides a biased guide to the appropriate, efficient update in PPS standardized amounts. The primary reason for this bias is the pervasive nonprice competition for patients, reinforced by inefficient nonprofit decision making, that dominates hospital cum physician modes of care. Unlike public utility regulators who set rates that customers then must evaluate in deciding on use rates, HCFA promulgates standardized amounts that bear little relation to what patients actually pay. Because hospitals are now paid by Medicare only on a

discharge basis and not on cost directly, they must compete vigorously for patients in order to survive. Without the enticement of lower prices, hospitals must constantly offer new services, new technologies, and new or better amenities (e.g., primary care nursing). Such competition adds substantially to costs, depresses Medicare margins when updates fall short of cost inflation, and heightens industry pressure for larger updates in future periods in order to remain solvent. Even "winning" hospitals raise costs by plowing back profits to achieve a (lower) future profit target. Consequently, any resort to industry-specific performance on cost, intensity, and productivity is bound to produce a self-fulfilling justification for higher updates to cover "justified" costs.

2.2 Critique of HCFA Approach to PPS Updates

2.2.1 Failure to Adequately Measure Within-DRG Casemix

One source of justifiable intensity increase is casemix severity. As a product-based payment system, DRGs are supposed to automatically capture severity increases that result in higher average costs per case. What is not captured is within-DRG severity increases. ProPAC has studied within-DRG casemix change extensively and concludes (1988, p. 94):

> *For the long term, case-mix measurement systems that use data in addition to that currently available from the discharge abstract may show greater promise than DRGs or alternative systems that rely on current abstract data. Additional research evaluating and comparing the systems is warranted to determine how such systems could improve case-mix measurement.*

In other words, no universally acceptable casemix system exists that can truly capture severity differences, nor is one expected in the near future.

The lack of a precise casemix system is compounded by the aggressive role of the PROs and the techno-organizational shift to outpatient care. In many DRGs, it is the simpler cases that are being treated on an ambulatory basis. And the definition of "simpler" is being redefined daily to include more serious cases. Hence, it is reasonable to expect that Medicare's DRG-based casemix index understates the growth in inpatient severity because of the systematic within-DRG bias induced by the PROs and the shifting locus of care. Early on

in PPS, this bias may have been more than offset by DRG upcoding, resulting in an overstatement of severity growth using the CMI. This offset has presumably disappeared after seven years, and CMI increases should accurately reflect cross-DRG shifts.

2.2.2 New Science and Technology: Illusory Costing

ProPAC has made a concerted attempt (with help from Project HOPE staff) to quantify the annual costs of new technologies. By their own admission, the minimal cost contribution for the 29 technologies ProPAC (1988, p.24) studied in depth (just $302 million in extra costs in 1989) was a downward biased estimate of technology's effect because it did not capture:

- improvements in existing technologies;
- adoption of relatively low cost technologies;
- subtle changes in practice patterns;
- future use of new technologies; and
- the limits of substituting new for old technologies.

For example, the estimates do not capture the cost impact of increased monitoring of diabetic patients or improvements in urinary incontinence control devices.

ProPAC has wrestled with the complex interrelation between new technologies, new admissions, and DRG payment. In their reports, the staff notes that many new technologies imply new admissions which are automatically paid for by a DRG payment at time of discharge. Others imply a switch from a lower to a higher cost DRG, which is also automatically reflected in DRG payment. A potentially serious understatement of technology-related costs is due to the on-going diffusion and innovative applications of technologies to inpatients within DRGs.

Another example of the pitfalls in approaching new technologies in such a direct manner is ProPAC's treatment of PTCA. In their 1987 report, ProPAC (p. 28) had a $45 million cost savings from this technology relative to CABG surgery. In 1988, they reported PTCA as adding $48 million to costs "because it creates new indications for treatment...[in] a number of people who would not otherwise have undergone surgery." (p. 23) Many technologies may

be cost-saving as a theoretical substitute for more expensive care, but in fact they often do not substitute but either create new admissions or, in the case of failed PTCAs, add to the cost of CABG surgery. What, then, is to be done with obsolescent technologies that still generate operating and capital costs?

In the final analysis, expert panels working with normative guidelines will likely underestimate the diffusion of old and new technologies throughout an industry caught in the throes of nonprice competition. Capital expenditures will be made and higher operating costs incurred for low volume technologies in order to compete for routine as well as complex cases.

2.2.3 The Productivity Offset: Trying to Simultaneously Measure Momentum and Position

The Heisenberg Principle asserts that it is theoretically impossible to simultaneously quantify both the momentum and exact position of a subatomic particle.* Likewise, it may be impossible for the hospital rate setter to measure the true, or potential, productivity gain in hospitals engaged in vigorous nonprice competition under fixed DRG rates. The very act of instilling competition via prospective rates alters the product being delivered and the manner in which it is produced.

Simplistic industry productivity measures are no help. Since 1983, the number of FTEs per 100 Adjusted Daily Census has risen from 357 to 411 (1989), a 15% "productivity decline." Moreover, such crude productivity measures confound productivity with intensity and casemix changes and, hence, are useless as offset measures when applied in conjunction with casemix and technology adjustments. (In fact, crude productivity ratios would imply declining productivity and greater add-ons.)

Economists prefer a "pure" productivity measure that focuses, not on discharges, but on intermediate hospital inputs (e.g., x-rays, MRIs). It may be that hospitals are becoming

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*This is because the energy involved in "shining a light" on a particle for measurement purposes affects its momentum and position; one of which must be known in order to determine the other.

more efficient at producing intermediate outputs, but physicians are simply bundling many more intermediate services into a discharge in their "workshops."

Staff at CHER have developed two alternative methods of estimating intermediate productivity gains. One involves the use of MONITREND data on paid hours per intermediate service at the department level (e.g., lab hours per workload unit, hours per operation). These data tend to show some productivity gains in the overhead support services such as housekeeping, but fail to show gains in ancillary departments. This is presumably due to a more complicated mix of within-department outputs (e.g., surgery).

Another way of measuring intermediate productivity is by using AHA deflated gross revenues as an output measure. Deflating gross revenues by the hospital component of the CPI should produce a reasonable index of intermediate output growth to the extent all services are individually priced. From 1986 through 1989, this output index shows 3-4 percent growth vs. -1.6 to +1.4 percent growth in outpatient-adjusted admissions. A deflated revenue-based index shows FTE labor productivity growth of +.5-1.0 percent annually, practically the only source showing positive hospital productivity growth, however weak.

Both methods have limitations. MONITREND output measures do not always reflect intermediate product changes. All med-surg patient days are treated the same, for example, as are diagnostic radiology tests. Deflated gross revenues should be better, but they rely on BLS hospital price deflators which incorporate some intensity increases. Higher prices for a routine bed-days, for example, include changes in nursing intensity. By using it as a deflator, routine bed charges are over-deflated when attempting to produce an index of intermediate service intensity that reflect more nursing care per discharge.

Finally, the switch from almost complete cost-based reimbursement to fixed DRG rates for Medicare and discounted charges for private payers has forced hospitals to (a) hire more and better management, and (b) pay more attention to quality assurance. These increases mask any true productivity gains in clinical departments. Rather lengthy "short-run" responses to PPS and other market forces cast a pall over any attempts to use industry-specific productivity data to justify an offset to the PPS update.

2.2.4 Is the Product Worth the Cost?

An even more intractable issue is the valuation of an ever-growing bundle of intermediate services per discharge. Conventional reliance on value added as an output indicator fails for hospital care because patients pay such a small fraction of their bills. They (abetted by their physician agents) "overconsume" because they "undervalue" the cost, and new, cost-increasing technologies are adopted at inflationary rates. We know MRIs, open-heart surgery, etc., have value, but how much in comparison to cost? Half? Ten times?

And what about the more sophisticated argument that the American people, by continuing to pay higher insurance premiums and FICA taxes, reveal their willingness to (indirectly) pay for health care, if not at point of use? Newhouse (1992) reviews and discusses several reasons for rapid health care expenditure growth, including the aging of the population, insurance growth, rising incomes, supplier-induced demand, declining productivity, and defensive medicine. He hypothesizes that "the march of science," which produces similar expenditure rates across countries and between fee-for-service and HMO plans in this country, is something consumers are willing to pay for. And this may not involve a welfare loss if

> *...the appropriate first-best condition is not what would be observed in an uninsured market, but what consumers are willing to pay for on an insurance policy that would cover the technology in relevant states of the world. (Newhouse, 1992, p. 11.)*

Taxpayers and workers by their failure to rein in health care spending, may be revealing their preferences for a "state of the art" health insurance policy. If consumers did not feel new technologies were worth the price [i.e., higher insurance premium], then "it seems odd that we do not observe some firms trying to enter [the market] and offer at least some aspects of 1960s medicine at 1960s prices" (Newhouse, 1992, p. 14).

Newhouse's "willing to pay" argument is inconsistent with the hue and cry over high taxes and unaffordable health insurance. As for the marketing of 1960s medicine, this takes an ex post perspective and overstates the

choice. More reasonable would be the ex ante offer of maintaining state-of-the-art, 1990s, medicine at 1990s prices through 1995. Many people would certainly accept this offer, but ask them in 1995 to "return to 1990s" medicine and they might refuse to do to, possibly out of ignorance about the difference. Which decision, ex post or ex ante, involves a true welfare loss is unclear.

This is not to say that considerable one-time gains could not be had by eliminating unnecessary services; only that "if the march of science continues, after a few years we may wish to be back where we are now, spending over 12 percent of GNP on medical care..." (Newhouse, 1992, p. 17).

Recent polls that suggest people are increasingly unwilling to do so, or rising numbers of uninsured who can't pay for new technologies. One could argue that consumer ignorance is so profound that people do not know the value of what they are buying but want to have it anyway just in case. Higher PPS updates may support more hospital services and the latest technologies, but we still are not sure of their real value or likely use. Flaws in the political process may also create biases towards more health spending. The elderly generally support more spending on health and defend Medicare against reductions that might limit access. They also vote in disproportionate numbers, making the "median voter" older than the median age of the population. The medical industrial complex also lobbies hard for more health spending, broader insurance coverage, continued patient protection on drugs, etc.

3.0 ROLE OF PPS MARGINS IN SETTING PPS UPDATES

3.1 Economic Rationale for PPS

Cost-based reimbursement breeds inefficiency as payments depend, not on how careful management is in marshalling its resources, but rather on how much it spends. Market failure in the health industry is also well recognized. Patients do not choose their hospital based on an accurate assessment of costs and expected benefits. Hospitals, therefore, have little incentive to minimize costs in the non-Medicare market.

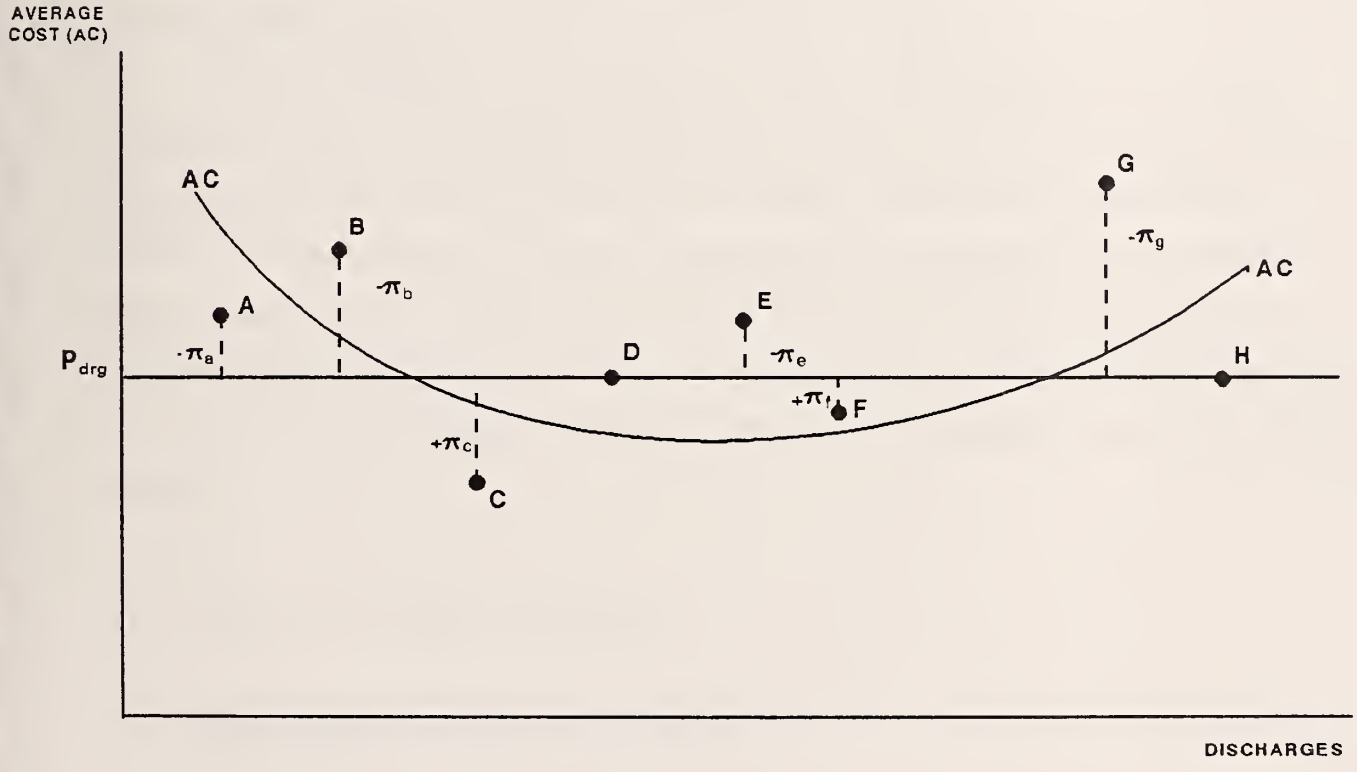
Medicare prospective payment was designed to supplant the market by forcing a "price competitive" solution. Prices were set in advance for each of 470 DRGs. Hospitals had to take these prices as given and were expected to lower costs in order to at least break even on their Medicare business.

This dynamic process can be represented in an illustrative diagram of the relation between PPS profits, discharges, and relative costliness (see Figure 3-1). Several hospitals are shown as alphabetic "dots" along with a single DRG price and an "average" average cost curve drawn through the middle of the points. Hospitals A,B,E,and G are all showing losses on their Medicare business while hospitals C and F are making money. Hospitals D and H are just breaking even. With just a single, unadjusted, DRG price with no teaching or other add-ons, higher cost facilities automatically incur greater losses.

In making a static comparison, it is important to note that not all "losing" hospitals are above the industry's "average" cost curve (hospital A is well below), and that some "winning" hospitals are above the industry average cost curve (hospital F). Hospital H, in fact, just breaks even while being well below its expected costs given its size.

Over time, three things caused Figure 3-1 to change. First, the horizontal DRG price line, aggregated across all DRGs, drifted upwards, partly due to conscious updates in the rates and partly due to unexpected shifts in DRG proportions. This made winners out of potential losers (say, hospitals' A,D,E, and H) while other hospitals enjoy even greater "windfall" gains (C and F).

FIGURE 3-1
Illustrative Diagram of Relation Between PPS Profits (π), Number of Discharges, and Relative Costliness



At the same time, inpatient volumes were generally declining, causing a leftward movement of the points in Figure 3-1. Hospital D, for example, might have moved back along the AC curve and become a loser (depending upon the rise in its DRG price). Indeed, many hospitals lost considerable volume and moved up the rising portion of their short-run cost curves.

Finally, hospital costs continued to rise, not only because of declining volumes and higher average fixed costs, but because of higher input costs. This eventually lowered Medicare margins, but before they began to fall, Congress reacted to seemingly extraordinary profits by curtailing the growth in DRG rates. The general consensus was that Medicare was overpaying hospitals, and PPS margins became the leading indicator of PPS updates. This made sense if one assumes, as did Congress, that extra profits were not necessary to bring forth the desired supply.

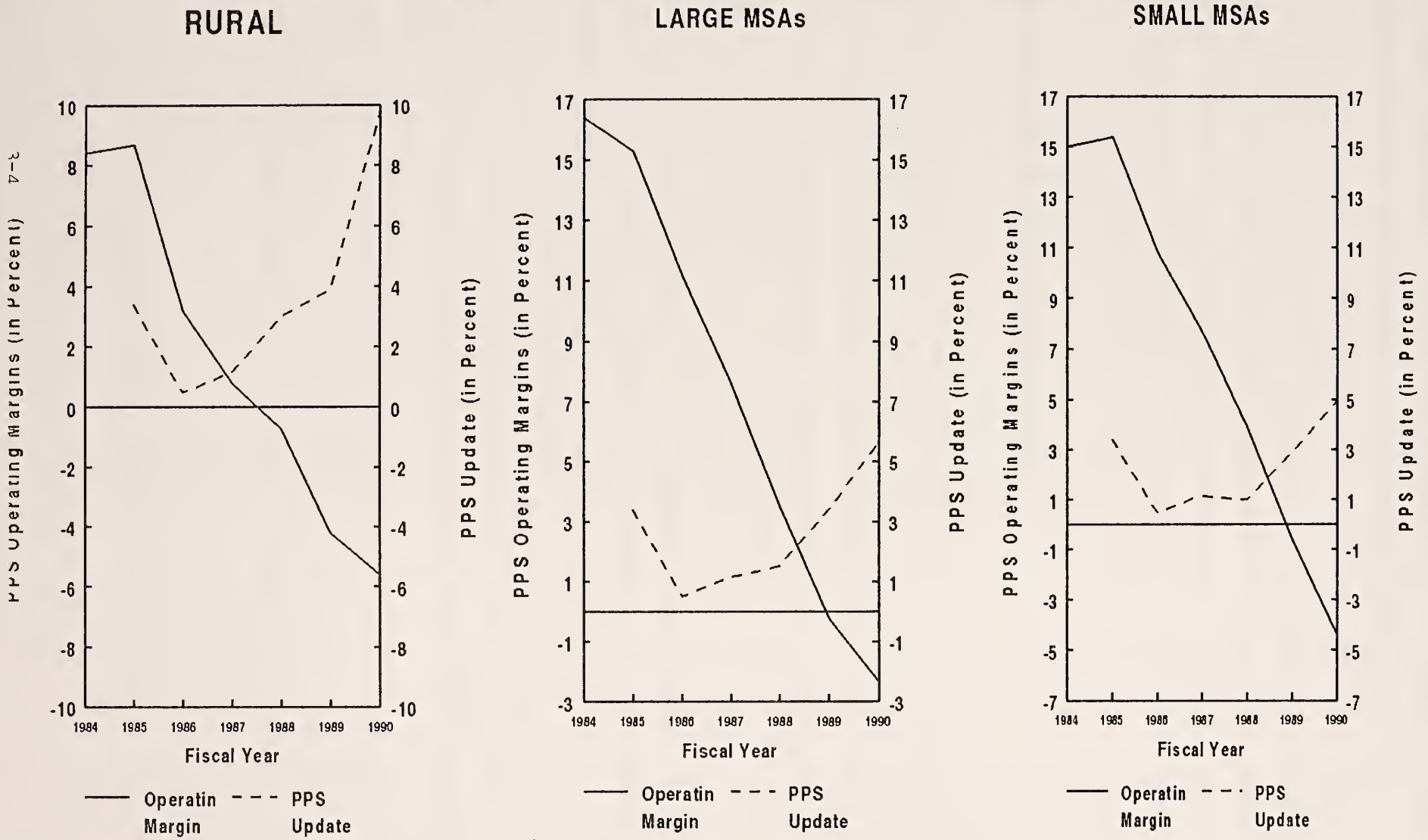
But what happens when PPS profits turn negative? What signals are these losses sending to Congress? This chapter addresses these questions, first, by showing the relation between PPS margins and updates and how the former influenced the latter with a lag. Section 3.3 then discusses the conceptual origins of any positive margins in a "nonprofit" industry like hospitals. Section 3.4 then critiques the validity of PPS margins and how to properly interpret them. Section 3.5 is a continuation of Section 3.4 in dealing with the thorny question of cross-subsidization. At bottom is the question of whether Medicare is "paying its fair share."

3.2 Trends in PPS Margins and Updates

3.2.1 How Updates have followed PPS Margins

Figure 3-2 shows trends in PPS operating margins and PPS updates in percentage terms for rural versus small and large MSAs. Hospitals in all three areas enjoyed extraordinary Medicare profits in the first 3-4 years under prospective payment, although rural margins have always been about 5-7 points below urban margins. After PPS1 and PPS2, Medicare margins have fallen sharply and consistently in all areas. Rural margins became

Figure 3-2
TRENDS IN PPS OPERATING MARGINS AND UPDATES



Source: Operating Margin, ProPAC (1992); PPS Update, unpublished data by HCFA/OACT

negative, on average, between 1988 and 1989 while urban margins turned negative a year later.

PPS updates were undifferentiated across areas through 1987, but Congress responded to the rapidly declining rural margins by authorizing higher updates for this group at the expense of urban updates. In all three areas, updates have increased from 1986 through 1990, peaking at 10 percent for rural hospitals in 1990. Significant increases in updates since 1986 do not appear to have even slowed the decline in PPS margins in any of the three areas, although 1990 may not have been quite as bad for rural and large MSA facilities. The limited impact of updates on average Medicare margins suggests that other factors are driving margins down and that very large updates would be needed to turn margins positive again.

3.2.2 Trends in the Distribution of PPS and Total Margins

Although PPS margins have fallen steadily since PPS1, not all hospitals have become losers or even suffered significant declines in PPS profitability. Tables 3-1 and 3-2 show the trends in PPS and total margins through the first five years of prospective payment. Clearly, the central tendency has shifted downwards as profits have fallen, but the distribution has also become more disbursed. In PPS1, one-in-ten hospitals had PPS margins of -5.3 percent or less. This threshold fell almost 20 points by PPS5, implying very serious losses for a significant number of hospitals. By contrast, the top 10 percent threshold fell slightly more than 5 points, opening up a 40 point gap between the top and bottom 10 percent of hospitals. Even the 75 percent threshold was showing a solid 8.6 percent margin or better by PPS5.

The size distribution of total margins (see Table 3-2) is remarkably constant given the large change in Medicare margins. The range between the top and bottom 10 percent grew only 1 point with the median hospital enjoying a solid 2.8 percent margin in PPS5 versus a PPS margin equal to -0.3 percent.

A widening dispersion of PPS profits was expected with the introduction of fixed prospective rates. In the short run, managers and institutions responded differently to PPS. Their facilities were also differentially situated with respect to utilization appropriateness

TABLE 3-1

SIZE DISTRIBUTION STATISTICS FOR MEDICARE INPATIENT TOTAL MARGINS: PPS1-5

	PPS1	PPS2	PPS3	PPS4	PPS5
Number of Hospitals	4,828	4,956	4,957	4,922	4,777
Thresholds					
Bottom 5%	-13.8%	-16.2%	-27.2%	-31.2%	-34.8%
10%	-5.3	-6.5	-14.7	-18.9	-23.3
25%	3.5	2.4	-2.8	-7.1	-10.5
Median	10.8	10.2	5.4	2.3	-0.3
75%	16.8	16.9	12.4	10.4	8.6
90%	22.2	22.9	18.3	17.1	16.8
95%	25.9	26.8	22.2	21.3	22.2
MEAN[a]	13.5	13.3	8.4	4.3	0.9

[a]Mean is weighted by net patient revenues.

Source: HER calculations based on HCRIS cost report data tapes.

TABLE 3-2

SIZE DISTRIBUTION STATISTICS FOR HOSPITAL TOTAL MARGINS: PPS1-5

	PPS1	PPS2	PPS3	PPS4	PPS5
Number of Hospitals	4,770	4,926	4,986	4,861	4,708
Thresholds					
Bottom 5%	-13.1%	-15.2%	-20.8%	-23.3%	-22.2%
10%	-6.2	-8.2	-11.9	-13.4	-12.1
25%	0.8	-0.3	-2.6	-3.4	-2.7
Median	5.7	4.5	3.0	2.5	2.8
75%	10.3	9.2	7.3	6.9	7.0
90%	16.4	14.1	11.7	11.2	11.6
95%	22.3	18.5	15.6	14.7	15.8
MEAN[a]	8.5	7.0	5.1	4.2	4.9

[a]Mean is weighted by net patient revenues. Slightly different from means reported in Table 3-1 as margins above 1.0 excluded in Table 4.

Source: HER calculations based on HCRIS cost report data tapes.

and competitiveness. Inappropriate admissions were culled out of the system in ways that fell unequally on hospitals previously using their acute facility more like a nursing home. Some were unable to keep pressures up to reduce stays and save on nursing costs. Others lost out in attracting new patients to fill unused beds. Thus, the rapid influx of PPS profits in the first two years proved ephemeral for most institutions as the competitive realities took hold. By PPS5, in a normal competitive market, many firms would have exited, bringing average profits back to an "acceptable" level. Yet, only 355 hospitals closed between 1984 and 1989, while another 97 merged and 121 opened (Adamache, 1991).

Why haven't more hospitals failed? The answer is found in the total margins, which remain robust for most hospitals. Accounting losses on Medicare patients have been offset by gains on other patients and nonpatient income.

> Yardstick competition [as PPS has been referred to] works [or doesn't] because it does not let an inefficient cost choice by a firm influence the price and transfer payment that the firm receives. It is essential for the regulator to commit...not to pay attention to the firms' complaints and to be prepared to let the firms go bankrupt if they choose inefficient cost levels. (Shleifer, 1985, p. 323) (italics added)

Congress has ignored this important rule by legislating higher updates for "financially endangered" groups of hospitals without explicit consideration of the source of their higher costs.

3.3 Conceptual Origins of Margins in a "Nonprofit" Industry

Large PPS margins early on in PPS and their subsequent decline may be explained by a profit target motive whereby non-profit hospitals attempt to achieve a profit target in the long-run by "smoothing" short-run deviations from the target over time.* Profit targetting is extremely important to a correct interpretation of the effects of PPS profits. Under this

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*For an analysis of the profit target hypothesis, see Friedman, B. and D. Farley, 1991.

hypothesis, high early PPS margins represented a short-run positive profit deviation, and, over time, hospitals voluntarily realized lower PPS margins in approaching their long-run profit target.

But where did high initial profits come from if hospitals are profit targetters? An explanation for the decline in PPS margins from their high levels in early PPS periods is that the uncertainty introduced by PPS reimbursement and the PROs engendered cost-cutting and other behaviors in order to insure that an "acceptable" profit level was obtained. Hospitals facing a very uncertain regime froze wages, negotiated lower nonlabor supply prices, engaged in DRG upcoding, reduced lengths of stay, laid off nurses and nonprofessional labor, and (presumably) raised prices to charge-paying customers. The result of these responses was a drastic reduction in inpatient cost inflation in PPS1 coupled with large PPS revenue increases. During PPS1, for example, PPS-related inpatient costs rose only 1.9 percent while PPS payments went up 18.5 percent (ProPAC, 1992). Once many hospitals realized that they had overreacted to PPS, they returned to their normal cost patterns (PPS costs rose roughly 10 percent annually from PPS2 through PPS6) while Medicare payments grew another 10.3 percent in PPS2 then only 3-5 percent thereafter.

Of course, for a subsector of hospitals, declining profitability was more involuntary, and they remain a source of concern. But their "involuntary" profit declines are commingled with the "voluntary" declines of consistent PPS winning hospitals when average industry PPS and total margins are discussed. The degree of voluntarism, or planned low/negative PPS margins in a relevant (but quite unknown) fact in correctly interpreting the seriousness of negative PPS margins.

3.4 Further Implications of Profit Targetting for Hospital Behavior

Roughly 85 percent of U.S. hospitals operate under nonprofit status, which means they are exempt from all profit taxes. And to maintain their nonprofit tax status, they can not redistribute income to stockholders or in any way to benefit a class of hospital employees or

managers personally. On the other hand, nonprofit hospitals can, and do, earn profits, either directly on patients or indirectly through nonoperating revenues.

If their non-profit status reflects goals other than maximizing profits consistently over time, then profit rates no longer mean what they do in other industries. A more realistic model of hospital behavior is one where the institution attempts to maximize a utility function of several goals (e.g., sales, prestige), possibly with a minimum target profit rate, although this, too, is controversial. Assuming hospitals maximize utility (whatever this is) subject to a minimum profit target, this has definite implications for profits as a guide to performance, efficiency, and financial distress, both individually and for the industry as a whole. If, for example, the interval target rate was 3 percent, unanticipated variation in admissions, expenses, and payments could result in year-end deviations from 3 percent. Disappointing performance should lead to higher prices and more cost control next year so that the two-year profit rate will average 3 percent, and vice-versa for exceptional performance. In other words, higher-than-expected profits should result in less cost control and/or lower price increases in future years in order to drive the average profit rate down to the target over time. Declining profit rates, therefore, do not necessarily mean a worsening market position or inadequate reimbursement rates, but, rather, a voluntary "spend down" of accumulated reserves.

Where does the target come from if it does exist? First, there may be two, interrelated, targets, one for patients and another based on total facility revenues. Under perfect certainty, a non-profit hospital might set a total facility target of zero percent and a patient margin of, say, -2 percent. A zero facility profit rate would be consistent with a world where revenues, admissions, and costs were known with certainty ex ante so that there was no risk of running a loss that might jeopardize survival. A positive facility profit target would be appropriate, even among non-profit hospitals, if volumes and payments were variable and hospital Boards of Directors are risk averse and wish to avoid a loss of X percent at 99 percent certainty.

A minimum target profit rate, as opposed to maximizing profits at every point in time, has several important implications. First, a profit targetter will not minimize costs at every point in time, nor even at any point in time. This is meant in several possible ways. If the entity is a sales, or volume, maximizer subject to a profit minimum, marginal costs will exceed

marginal revenues at equilibrium and the institution will be operating with too large a scale relative to the profit-maximizing output. If the entity is an intensity per unit maximizer subject to a profit minimum, total discharges may be less than optimal but ancillary services may be used beyond where marginal cost equals marginal revenue (or benefit). Alternatively, if the hospital is the doctor's workshop, nurses may be overused and not closely managed, resulting in technical inefficiency. Thus, profit targeting, as opposed to profit maximization, can lead to scale, allocative, and/or technical inefficiency with the result that too many resources are devoted to the industry, either
because there are too many discharges, or intensity is excessive, or resources are not optimally managed.

3.5 Validity and Proper Interpretation of PPS Margins

So far, we have assumed that profits have been fully and properly reported on Medicare Cost reports. This section critiques this assumption and offers caveats to any causal interpretation of PPS margins.

3.5.1 Limits of Full Cost Accounting

PPS margins are calculated as the difference between actual PPS payments (usually ignoring PPS passthrough costs) and estimated inpatient costs allocated to Medicare patients, divided by payments. Total patient and hospital margins are derived slightly differently in that revenues are measured on an accrual basis, with billings adjusted for payer discounts and disallowances, and costs, of course, cover all patients and do not have to be "allocated."

3.5.1.1 Outpatient Costs

For years after PPS was implemented, Medicare outpatient department costs continued to be reimbursed on a cost basis. This produced a direct incentive for hospitals to change their statistical bases in order to shift costs to the outpatient sector. The result of any accounting

shift to the outpatient sector would be an upward bias in the inpatient PPS margin. This may have artificially raised the early PPS margins by an unknown extent as hospital accountants responded to these incentives. Consequently, full-cost accounting methods--as applied using the Medicare cost-finding algorithm--will inflate inpatient PPS margins.

3.5.1.2 Fixed Versus Variable Routine Costs

An offsetting effect of full-cost accounting is the treatment of fixed and variable costs. Stepping down overhead costs, as well as including all fixed costs, produces a fully-loaded average cost per patient day in each hospital's bed accommodations or an average cost-to-charge ratio in each ancillary department. Assume that Medicare's average length of stay in routine care fell one day while non-Medicare length of stay remained constant and that this constituted a 10 percent fall in Medicare days. If Medicare was one-half of the hospital's patient days, then Medicare's allocated routine costs would fall 5.26 percent, assuming all costs are fixed.* That is, Medicare costs would fall only slightly more than half of the percentage fall in Medicare days because average per diem costs would rise 5.26 percent (due to the ten percent fall in Medicare days). Assuming Medicare discharges remained unchanged, Medicare revenues would not change, and PPS margins would rise 5.26 percent. If PPS margins were zero prior to the volume loss, then PPS margins would have risen to 5.26 percent (of revenues) in absolute dollar terms. Is the hospital really making 5.26 percent off its Medicare patients in a 100%-fixed cost regime? Is it losing 5.26 percent off its private patients?

Of course, hospitals wouldn't discharge Medicare patients earlier unless they could reduce (variable) costs. Hence, a 10 percent decline in Medicare days will produce more than a 5.26 percent decline in Medicare costs as the average per diem fails to rise a full 5.26 percent (because of reduced variable nursing costs). To the extent that the marginal costs of extra days

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*Assuming constant per diem costs and a 50 percent share of patient days, a 10 percent fall in Medicare days results in a reduction in Medicare costs of 5.26 percent. The equation for this reduction is: $[[\text{per diem}]*(x/(x+y)) - [\text{per diem}]*(.9x)/(.9x + x)]/[[\text{per diem}]*(x/(x+y))] = (0.5 - (.9x/1.9x))/0.5 = 5.26$; where x = Medicare days; y = non-Medicare days; and per diem = costs per day. Note that x = y.

are less than average costs for the entire admission, the Medicare cost-finding algorithm reallocates too much cost to other payers. A 10 percent fall in Medicare days may enable hospitals to lower costs by only 2.5 percent (= 10 percent * 50 percent of patients * 50 percent variable per diem costs). Yet, Medicare costs would be calculated to fall 5.26 percent.

PPS margins by their very nature are artificial in the sense that they require certain assumptions about marginal costs. Total patient margins do not suffer from the allocation problem as they incorporate all patient use and costs. Hence, they would appear to be more accurate, although they may still suffer from incentives to reallocate inpatient costs to the outpatient sector.

3.5.1.3 Ancillary Mark-ups Bias Medicare's Cost-Finding

Another source of bias is in ancillary charges. If Medicare patients use more of services with higher markups, then their ancillary costs will be overstated. We know that under cost-based reimbursement hospitals had a reimbursement incentive to raise markups on Medicare-intensive ancillary services within cost center. Such a bias certainly persisted in the first few years of prospective payment and likely led to an overstatement of Medicare costs and lower PPS profits. To our knowledge, no information exists to quantify this bias.

This ancillary service "markup bias" also explains in part why higher CMI hospitals are financially better off.* It is likely that markups over true costs are higher on more expensive, ancillary-intensive, DRGs. The result is a systematic overpayment of "costs," as DRG relative values are now based on charges, not costs. Concern over "cost-compression" of DRG rates may have been misplaced if "markup explosion" produces overpayment in expensive DRGs.

3.5.2 Accuracy in Reporting Revenues

PPS also differs in its accounting of Medicare revenues from the way hospitals account for revenues. HCFA, in calculating PPS margins, estimates the average DRG payments for all

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*Cromwell and Burge (1991) found casemix to be a significant determinant of Medicare margins, total patient margins and total hospital margins using separate GLM regression models on PPS hospitals in PPS5.

Medicare patients in each DRG, adjust for any special add-ons such as Indirect Medical Education, and multiply by the number of Medicare patients. In figuring total patient revenues, however, hospitals make an accounting allowance on submitted bills (including Medicare) for expected discounts and bad debts as well as third party settlements. This allowance is an estimate which can be "fudged" to make net revenues look higher or lower than they actually turn out to be when all bills are paid. Hence, Medicare PPS revenues found on the cost reports are not as prone to disallowances and may be a more accurate measure of payments than for other payers. Consequently, hospitals may show relatively low total patient margins compared to Medicare because of accrual-based accounting that enables them to overstate expected unfavorable third-party settlements. PPS margins do not suffer from this problem as analysts work with actual DRG payments.

Hospital revenues also flow from sources other than patients. Besides contributions and public tax subsidies, these nonpatient revenue sources can include parking lots, investment income, gift shop, rental of office space to physicians and others, sale of drugs, etc. Suppose a hospital was showing a PPS margin of -2 percent but was enjoying an extra 10 percent (on total revenue) in nonpatient revenues from rentals on a doctors' office building. Don't PPS revenues and Medicare patients support the hospital's opportunity to make a profit on its related assets? If Medicare were half the hospital's revenue, shouldn't PPS be credited with 5 percent more revenues, turning a 2 percent loss into a 3 percent gain? If a hospital is truly nonprofit in the global sense, couldn't it run losses on both Medicare and non-Medicare patients yet still break even through nonpatient, related, revenues?

3.5.3 Off-Balance-Sheet Transactions

Attempts have been made by ProPAC and others (Peden, unpublished) to measure the extent of cumulated profits of hospitals to better interpret the financial implications of zero or negative short-run PPS margins. If hospitals accumulated significant profits in the early years of PPS, then negative PPS margins over several years may be a way of reclaiming some of the excess payments.

According to arguments put forward by Nancy Kane, this is not a simple measurement issue. At the end of the year in which a hospital enjoys profits, it must record them in its own income and balance sheets. Next year, however, it can transfer any amount of profits completely off-balance-sheet to a holding company. As long as the use of these profits does not jeopardize the hospital's nonprofit tax status, they can be used for a wide variety of investment activities. Moreover, profits from these outside ventures can be (and are) transferred back onto the hospital's balance sheet to support building and equipment investments without ever appearing on the income statement. If they were to reappear as income, then profits would be greatly increased in the year in which they were transferred, making the institution appear as solvent as it probably is.* Some hospitals can continue to invest and grow on seemingly little accumulated profits. To properly evaluate current PPS profitability relative to accumulated profits, one must cumulate past PPS (and other) profits on an annual basis rather than using total fund balances which are subject to off-balance-sheet translations.

3.5.4 Cash Flow Versus Accrual Accounting

Even applying the standard measure of profitability to the hospital industry may understate its financial performance. As Nancy Kane has noted (Kane, 1991),

> ...profits must be evaluated in light of the financial requirements hospitals have undertaken. Hospitals that are profitable may not generate enough cash to meet their debt obligations or plant replacement needs; while hospitals that are unprofitable may nonetheless generate enough cash to cover such requirements (p.29).

In for-profit industries, positive profits usually imply a strong financial position and little likelihood of bankruptcy. They also signal entrepreneurs of the advantages of reallocating capital to profitable industries and individual firms. The hospital industry, being primarily nonprofit, does not operate under the same capital incentives or requirements.

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*Transfers back are not counted again as income to avoid double counting.

Nonprofit hospitals do not need to generate profits in order to attract investment capital, nor are profits needed even to survive in the long run if alternative capital sources are available (e.g., donations, tax subsidies). So long as the entity can meet its on-going cash requirements, Kane emphasizes, it can continue in perpetuity without generating positive profits. Indeed, she argues (Kane, 1991, p. 29) that hospitals may pursue a negative profit, high investment, strategy in order to gain market share while "health planners may prefer a less competitive, more affordable strategy."

3.5.4.1 Depreciation: The Hospital's Cash Cow

A key to interpreting profits is the role of depreciation allowances. Hospitals legitimately set aside an annual depreciation allowance for plant replacement and expansion. This allowance is not an incurred expense that must be paid from current revenues, but it reduces accounting profits on the standard, accrual-based, income statements. Thus, hospitals may be just breaking-even, or even losing slightly, but still setting aside millions of dollars annually for new buildings or equipment and be cash-rich. And although inflation will erode some of the purchasing power of funded depreciation, the amount should still generate substantial equity in new plant and equipment, and any additional required funds can be borrowed. Also debatable is the need to replace all hospital structures in the United States or every hospital replacing and upgrading its equipment. If society believes that the hospital capital stock is too large, that there are too many beds, that too many hospitals invest in expensive, underutilized, equipment, then negative profits are desirable--at least in the short run. This is exactly what has happened in the last 8-10 years as inpatient volumes have plummeted.

3.5.4.2 Settlements and Deferred Revenues? How it Pays to be Conservative

Besides debt and depreciation, third party settlements and deferred revenues can depress reported profits but not cash reserves. Overly conservative allowances for potentially unrecognized third party payments will depress reported profits by lowering expected

revenues. When settlements are made in the hospital's favor, previously reported profits are not adjusted upwards. And while these adjustments may appear in next year's fit, a cumulative lag can generate a perpetually, large amount of unaccounted for revenues making profit streams appear lower than actual cash inflows.

Nonoperating revenues such as investment income from invested depreciation reserves, donations, etc. also do not appear in "operating" or "patient" margins. Yet, in the final analysis, it is patients, or their third-party insurers, who are providing the funds to generate much of these nonoperating revenues, if not directly through funded depreciation, then indirectly by encouraging endowments.

In the final analysis, accrual accounting in an essentially nonprofit industry can be manipulated to give the appearance of financial distress when the opposite may be the case on a current cash-flow basis. This not to gainsay the serious implications of running large, negative, patient margins--particularly in nonteaching hospitals. What it means is that financially solid institutions, over time, will tend towards zero (or even slightly negative) patient margins which has the effect of turning average industry patient margins negative; this, in spite of the fact that the majority of institutions are financially solvent.

3.6 Cross-subsidization Vs. Third Degree Price Discrimination in Hospitals

There is a reasonable literature on cross-subsidization in the hospital industry (Harris, 1979; Danzon, 1982; Hay, 1983; Meyer, 1983; Sloan and Becker, 1984). Some has even focused on Medicare prospective payment (Hay and Ernst, 1984; Foster, 1985). This literature makes important distinctions between cross-subsidization, which involves covering losses on one line of business by profits on another, and pure price discrimination, which involved varying markups on costs for different lines of business. Indeed, pseudo-losses on Medicare may not be losses at all at the margin, nor may they be losses when other payers are considered.

Consider a standard third-degree price discriminator that attempts to maximize profits (see Fig. 3-3). Private insurer demand curve (AR) and marginal revenue curve (AB) are downward sloping reflecting the hospital's monopolistic control over price. Medicare

prospective payment per DRG is indicated by the horizontal line, $P_{drg}C$. It is shortened to reflect the fact that any one hospital's share of the Medicare market is limited by its size and referral patterns. It is drawn such that the final mix of Medicare and private patients is roughly 40-60 percent. The hospital's total marginal revenue curve is the horizontal sum of the two marginal revenue curves, or ADEG. The profit-maximizing number of discharges (D_T) would be determined at the intersection of marginal revenue and marginal cost (MC) at point F. Working backwards to the left, the hospital should set prices in the two markets such that marginal revenues in each market equal the uniform marginal cost. In the private market, this implies a price, P_{pr}, while in the Medicare market, the hospital is willing to take all the Medicare patients it can get at the going DRG rate.

Assuming uniform patient costs per discharge for public and private patients, the single average total cost, AC_T, is compared by insurers to their own prices. Therefore, Medicare patients, whose insurer has "negotiated" a low flat rate, appear to generate a loss equal to π_{drg} versus a positive profit of π_{pr} for private patients.

Is the hospital better off taking Medicare patients at such low prices? The answer is yes. So long as the DRG price exceeds the marginal (variable) costs of Medicare patients, the hospital increases its profits (or reduces its short-run losses) by taking them.

Are private patients subsidizing Medicare patients who are not covering their average costs? No, because the hospital is making as much off each payer as it can. It is just that private payers are more willing to pay higher prices. Their price sensitivity is far less than Medicare.

What if the hospital refused to take Medicare patients. Then, still assuming profit maximization, the hospital would set a slightly lower price to private payers such that private marginal revenue equals marginal cost (point I). Private patients and payers would be slightly better off in paying lower prices and receiving a few more admissions. The hospital would be financially worse off, however, due to rising average costs on many fewer discharges (slighty to the right of point J) and slightly lower private prices. The hospital is willing to cut back a bit on private patients, charging them slightly higher prices while admitting a large number of

Medicare patients at a fixed marginal payment rate and driving down average costs (to point H). Private payers forget that the sizable Medicare caseloads spread out the high fixed costs in hospitals.

Can the effects of Medicare margins on hospital solvency be evaluated without considering private profits or utilization? The answer, again, is no. In Figure 3-3, profits on private patients clearly varies with the number of Medicare discharges, ceteris paribus. The hospital is willing* to run accounting losses on Medicare patients in order to drive down overall average costs and increase its profits on private patients. Without Medicare, the best the hospital could do (approximately) would be (P_{pr} - J) profits per private discharge versus (P_{pr} - AC_T) per private discharge with Medicare. If it cannot get the government to pay its going private rates, it would have to be satisfied with the total margins it enjoys under third degree price discrimination, taking "paper losses" on Medicare and increasing its profits on private patients.

Would it help private payers if Medicare raised its DRG rates through higher PPS updates? Not according to Figure 3-3. Assuming no more Medicare patients could be admitted then D_{drg}, which may be true for a community as a whole, D_T would remain unchanged, as would marginal cost, so that private prices and volumes would stay constant. Medicare accounting losses would fall, of course, but only the hospital would benefit. It would seem that private payers, if anything, should be concerned over the hospital's profit maximizing behavior and not Medicare's ability to negotiate a prudent price.

What if hospitals were not profit maximizers, as they certainly aren't? What if they simply priced to break even. Then, according to Figure 3-3, private price would be lowered dramatically to near point H where private average revenue crossed average cost. Many private patients would be substituted for Medicare which is not covering average costs. If scale economies were strong enough so that AC fell below the DRG price, the hospital might take on some Medicare patients after most private patients were treated. Note that average margins would be zero for both payers.

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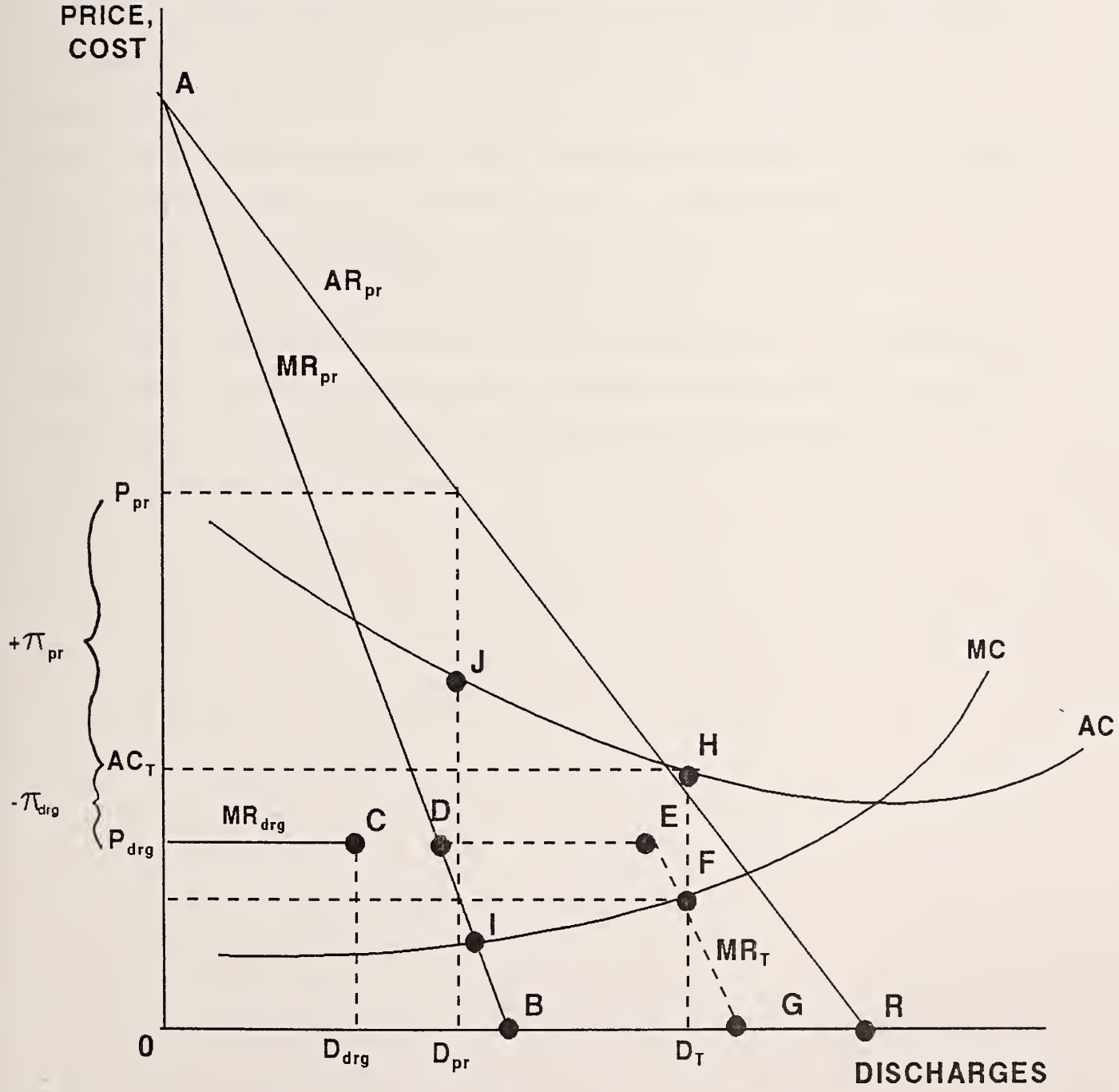
*Its willingness is reflected by its marginal cost curve which is also its supply curve.

Figure 3-3

THIRD DEGREE HOSPITAL PRICE DISCRIMINATION AND MEDICARE MARGINS



While the profit orientation of hospitals varies and is debatable among nonprofit hospitals, it seems reasonable to expect some positive profit level even among voluntary institutions because (a) equity must be preserved to finance new capital, and (b) the uncertainty of volume and costs calls for prices that err on the side of gains rather than losses.

In sum, in a world of third-degree price discrimination, Medicare margins should not be considered in isolation but in relation to the hospital's overall margins. If overall margins are positive, and the industry is still admitting Medicare patients without access constraints, then negative Medicare margins are only accounting artifacts with no behavioral and equity implications. Negative PPS margins reflect shrewd purchasing on the government's part as it extracts some of hospital's monopoly profits. This argument is even more true if the acute inpatient sector is believed to be oversized to begin with. Stringent DRG prices in the long-run could force some hospitals without large private patient bases (or endowment) to cut back on beds, services, and labor to drive average costs down to DRG rates.

From a regulatory or competitive perspective, and ignoring the very real problems of unnecessary utilization of inpatient services, a more interesting question is how to make the private demand curve more price sensitive in order to drive down average costs to low, or more efficient points on the cost curve.

4.0 CHARACTERISTICS AND PERFORMANCE OF CONSISTENT PPS WINNERS AND LOSERS

To date, reported margins have been the primary indicators of hospital performance used by health care analysts and policy makers. But in order to accurately gauge the adequacy of PPS payments, hospital performance also must be analyzed in terms of overall efficiency. Despite the downward trends in margins shown in Figure 3-2, many hospitals have thrived under PPS. On the other hand, many hospitals have shown consistently poor performances under PPS. We further analyze the characteristics of consistent PPS winners and losers in order to separate PPS payment biases from economic efficiency.

4.1 Definition of Consistent Winners and Losers

To assess the relation between PPS profits and efficiency, a stable set of consistent winning and losing hospitals was selected. Hospitals with high PPS profits in one year and low profits the next cannot be considered systematic winners or losers, nor will profitability by systematically related to the underlying cost structure.

Following the lead of ProPAC, we defined two hospital subsets whose PPS operating margins (excluding passthroughs) were in the top (winner) and bottom (loser) quarter of providers for three straight periods, PPS3-5. A large residual group of "middle" performers completed the classification system. In our sample of nearly 5,000 hospitals, about 1,200 reported high or low PPS margins in any single year. Of these, about 530 each consistently fell into the top or bottom one-quarter over three consecutive PPS periods. Requiring 3-period consistency resulted in roughly 50 percent attrition in the sample of profit outliers in any one year. Five hundred thirty cases, on the other hand, is far higher than one would expect if hospital profits were perfectly random from year to year. Over three years, we would expect only 1/64th of the industry (=1/4 x 1/4 x 1/4), or less than 80, to be consistent winners and another 1/64th consistent losers. This implies a storng, nonrandom, tendency in these groups towards large positive or negative profits.

4.2 Trends in Margins

Under PPS, consistent "winners" and "losers" have emerged. Table 4-1 shows the sharp performance differences between winners and losers. For example, from PPS3 through PPS5, winners averaged Medicare inpatient operating margins (excluding all PPS pass-throughs) of 20 percent while consistent losers averaged-21 percent. The difference in Medicare inpatient margins in PPS1 between consistent winners and losers was roughly 15 percentage points. By PPS5, the margin gap widened to roughly 45 points (18.4 percent for winners vs. -26.8 percent for losers). The hospital total patient margin (including all patient care revenues and costs) was similar in PPS1 between winners (12.2 percent) and losers (11.1 percent), but by PPS5 it had fallen by 11.2 percentage points in losers compared to a 3.4 percentage point decline in winners. Both winners and losers experienced lower total facility vs. hospital patient margins (including nursing homes, etc.), but the trends were similar in magnitude. The implication is that patient margins outside the hospital unit are generally smaller. If a large share of outpatient activity is paid on a cost-basis, this would naturally drive down total facility patient margins.

Total facility margins (including nonpatient revenues) reveal interesting temporal developments for winners and losers. Consistent winners posted total facility margins that were positive yet substantially lower than their PPS margins. Furthermore, the decline in total facility margins for winners (-1.9 percentage points) was about the same as the fall in their PPS margins (-2.0 points). The large absolute differences between total facility and Medicare margins likely reflect large uncompensated care burdens in urban teaching hospitals. Consistent losers were unable to absorb much of their 32 point fall in PPS profits, and their overall margins still turned negative (-2.8%), dropping 9.3 points. This is about the expected drop if Medicare was a thrid of their business. Losers were unable to completely offset drastic Medicare margin declines with other patient and non-patient revenue sources -- particularly outside the hospital.

TABLE 4-1

AVERAGE PPS AND TOTAL MARGINS FOR CONSISTENT PPS WINNERS AND LOSERS

Margins	CONSISTENT PERFORMERS PPS3-5**							
	LOSERS				WINNERS			
	PPS1	PPS5	Total Change PPS1-5	Average PPS3-5	PPS1	PPS5	Total Change PPS1-5	Average PPS3-5
PPS Inpatient Margin[a]	4.9%	-26.8%	-31.7	-21.0%	20.3%	18.4%	-2.0	20.0%
Total Patient Margin: Hospital[b]*	11.1	-0.2	-11.2	1.3	12.2	8.8	-3.4	8.5
Total Patient Margin: Facility[c]*	2.3	-8.4	-10.8	-7.0	3.6	-0.6	-4.1	-0.8
Total Facility Margin[d]	6.5	-2.8	-9.3	-1.6	8.3	6.3	-1.9	6.5

Notes: *Appropriate outpatient costs and revenues included.
**Consistent losers and winners defined as those hospitals in the lower or upper Medicare margin quartiles for PPS3, PPS4 AND PPS5.

[a]Defined as: 1 - Medicare inpatient operating cost/Medicare inpatient operating revenue. All pass-throughs excluded.

[b]Defined as: 1 - total hospital patient costs/total hospital patient revenue. Includes inpatients and outpatients treated in hospital unit only.

[c]Defined as: 1 - total facility patient costs/total facility patient revenue. Includes inpatients and outpatients treated in hospital and external entities (e.g., skilled nursing facilities, CORFs, Home Health Agencies, ASCs).

[d]Defined as: 1 - Total facility patient and nonpatient care costs/total facility patient and nonpatient care revenue. Includes inpatients and outpatients for total facility and all nonpatient revenues and costs (e.g., parking lots, gift shops, investment income, government subsidies).

Source: Calculations on Medicare Cost Report Data (HCRIS: PPS1, PPS5).

4.3 Hospital-Specific Characteristics

Table 4-2 shows the percent of hospitals by characteristic falling into the consistent winner or loser category. The probability of any member of a particular hospital group (H_i) being a consistent loser (L) can be determined by using the conditional probability formula (Freund and Walpole, p.55-6, 1987)

$$P[L \mid H_i] = P[L]*P[H_i \mid L]/P[H_i]$$

where $P[L \mid H_i]$ = probability of being a loser given characteristic i. Thus, the probability of a rural hospital being a consistent loser is roughly 16% = (529/4,800)*(75/100)/(51/100) = (.11)(.75)/(.51) versus 5.6% = (.11)(.25)/(.44) among urban hospitals in general. Hence a rural hospital is nearly 3 times as likely to be a loser compared to an urban hospital, i.e., the odds ratio = 3. The situation is reversed among winners:

$$P(W \mid \text{Rural}) = (532/4,800)*(34/100)/(51/100) = 7.4\%$$
$$P(W \mid \text{Urban}) = (.11)(.66)/(.49) = 14.8\%,$$

and urban hospitals are nearly twice as likely as rural hospitals to be winners.

About 10 percent of all hospitals are likely to be consistent losers while another 10 percent are likely consistent winners under PPS, i.e., a 1-to-1 odds ratio. Yet, some hospital subgroups face considerably different odds. Indirect medical education payments were explicitly increased by the Congress in order to assure the financial viability of teaching hospitals. They clearly have succeeded. Teaching hospitals have an 18 percent chance of being a consistent winner vs. only a 4 percent chance of being a loser. Under 50 bed rural hospitals have a 22 percent chance of being losers vs. 9 percent of consistently winning. Under 100 bed urban hospitals have only a 9 percent chance of losing (vs. 22 percent for small rural hospitals) and an 18 percent chance of winning. Very large urban hospitals have a very low, 3 percent, chance of losing vs. a 13 percent chance of winning.

TABLE 4-2

FREQUENCIES OF HOSPITAL CHARACTERISTICS FOR CONSISTENT PPS WINNERS, LOSERS, AND THE TOTAL PPS SAMPLE

	CONSISTENT PERFORMERS: PPS3—5**				
	LOSERS		WINNERS		
	Percent	N	Percent	N	Overall Hospital Frequency
RURAL %	75%	397	34%	179	51%
URBAN %	25	132	66	353	49
VOLUNTARY	41	218	58	310	55
PROPRIETARY	11	57	15	81	15
LOCAL GOVERNMENT	48	253	27	141	30
URBAN					
VOLUNTARY	54	71	62	220	64
PROPRIETARY	26	35	18	62	22
GOVERNMENT	20	24	20	71	15
RURAL					
VOLUNTARY	37	147	51	90	46
PROPRIETARY	6	22	11	19	10
GOVERNMENT	57	229	39	70	44
TEACHING STATUS					
NON-TEACH	94	497	72	383	83
MINOR TEACH	5	28	19	102	14
MAJOR TEACH	1	4	9	47	3
BED CATEGORY					
RURAL <50	51	269	21	110	25
RURAL 50-99	16	87	6	34	15
RURAL 100-169	6	30	4	20	7
RURAL >169	2	12	3	15	4
URBAN <100	11	59	21	114	12
URBAN 100-199	9	45	17	90	15
URBAN 200-299	3	18	11	56	10
URBAN 300-404	1	4	9	47	6
URBAN 405-504	1	3	5	24	3
URBAN >504	1	3	4	21	3
DIS. SHARE STATUS					
NOT QUALIFIED	87	458	58	307	75
URBAN GE 100	6	32	32	172	18
URBAN LT 100	2	10	3	17	2
OTHER RURAL	6	30	7	35	5
PAYMENT STATUS					
OTHER RURAL	63	334	25	132	41
SOLE COMMUNITY HOSPITAL	12	61	4	21	6
RURAL REFERRAL	1	5	5	27	4
OTHER URBAN	24	129	66	352	48
Total N		529		532	

Note: **Consistent losers and winners defined as those hospitals in the lower or upper Medicare margin quartiles for PPS3, PPS4 and PPS5.

Besides IME add-ons for teaching hospitals, PPS also extends add-ons for disproportionate share hospitals, pays Rural Referral Centers (RRCs) the urban rate, and allows Sole Community Hospitals (SCHs) to remain primarily on their trended 1982 (now 1987) base year costs. Table 4-3 compares the probabilities of being a consistent loser with the combined effects of Medicare casemix increases and PPS policy changes (including the PPS update). Through 1992 (projected), ProPAC estimates that the PPS per-case payments have increased 57.4 percent. In spite of these sizable increases, roughly 10 percent of all hospitals have PPS margins consistently in the lowest quarter. In general, PPS policy updates have been higher for the targetted groups -- particularly Sole Community and rural Disproportionate Share Hospitals. These are also groups more likely to be consistent losers (see Table 4-2). On the other hand, the very strong financial performance of teaching and rural referral hospitals raises the question of the need for special add-ons and exceptional adjustments. (The low policy update for teaching hospitals does not reflect the doubling of the IME add-on to begin with.)

4.4 Volume Characteristics

Volume change and reported margins for PPS winners and losers appear highly correlated from values shown in Table 4-4. Specifically, patient days and discharges--both total and Medicare--declined from PPS1 to PPS5 in both groups, but declines were more pronounced for consistent losers. Patient days from PPS1 to PPS5 fell only 6.1 percent for winners and 24.3 for losers. Total discharges fell by only 0.5 percent over four years among winners vs. 19.4 percent for losers. In addition, Medicare days and discharges decreased over the same period by 4.5 and 4.0 percent for winners; and 19.5 and 21.1 percent for losers.

Reductions in days and discharges may have resulted from PPS incentives to reduce length of stay while the PROs (Peer Review Organizations) eliminated many inappropriate days and admissions. Overall length of stay fell by 4.2 and 4.8 percent for winners and losers, respectively. Medicare length of stay actually rose 1.0 percent in winning hospitals compared to a 4.2 percent decline in losing hospitals. (This ignores declines that occurred between TEFRA and PPS1.)

TABLE 4-3
PROBABILITY OF BEING A CONSISTENT LOSER VS. TOTAL CASEMIX PLUS POLICY UPDATES

	PROBABILITY OF BEING A CONSISTENT LOSER (PPS3-5)	TOTAL CASEMIX AND POLICY UPDATE (1984-92)	POLICY UPDATE
ALL HOSPITALS	10.0%	57.4%	24.9%
MAJOR TEACHING	2.9	49.2	13.9
OTHER TEACHING	4.2	54.0	19.7
RURAL REFERRAL	2.6	59.4	29.0
SOLE COMMUNITY	21.1	71.8	51.4
DISPROPOTIONATE SHARE			
LARGE URBAN	8.3	63.3	26.5
OTHER URBAN	10.4	58.8	23.5
RURAL	12.5	78.2	49.0

Sources: Probability of Being a Loser: calculated based on data in table 4-2
Casemix and Policy Update: ProPAC (1992, Table 2-3)

TABLE 4-4

MEAN VOLUME AND SIZE MEASURES FOR CONSISTENT PPS WINNERS AND LOSERS, AND ALL OTHER HOSPITALS: PPS1, PPS5, AND PERCENT CHANGES PPS1-5

	CONSISTENT LOSERS			MIDDLE			CONSISTENT WINNERS		
Volume	PPS1	PPS5	Percent Change PPS1-5	PPS1	PPS5	Percent Change PPS1-5	PPS1	PPS5	Percent Change PPS1-5
Patient Days	14,347	10,859	-24.3%	43,755	38,631	-11.7%	40,698	38,220	-6.1%
Discharges	2,553	2,058	-19.4%	7,318	6,826	-6.7%	7,343	7,303	-0.5%
Medicare Days	6,207	4,998	-19.5%	20,216	18,985	-6.1%	16,029	15,302	-4.5%
Medicare Discharges	833	658	-21.1%	2,526	2,398	-5.1%	2,151	2,066	-4.0%
Percent Medicare:									
Days	43%	46%	6.4%	46%	49%	6.4%	39%	40%	1.7%
Discharges	33%	32%	-2.1%	35%	35%	1.8%	29%	28%	-3.4%
Medicare Length of Stay[b]	7.54	7.86	4.2%	8.15	8.20	0.6%	7.63	7.71	1.0%
Total Length of Stay[c]	5.73	5.46	-4.8%	6.10	5.85	-4.0%	5.66	5.43	-4.2%
Casemix Index	1.02	1.08	5.8%	1.13	1.20	6.4%	1.13	1.20	6.1%
Beds	78	73	-7.2%	191	181	-5.2%	175	166	-5.0%
Occupancy	48%	44%	-7.3%	60%	57%	-4.8%	59%	58%	-0.4%
Capital Per Discharge[a]	290	338[d]	16.6%	238	295[d]	23.9%	219	295[d]	34.6%

Notes: Consistent losers and winners defined as those hospitals in the lower or upper Medicare margin quartiles for PPS3, PPS4 and PPS5.

[a]Adjusted by casemix, wage index, and cost of living.
[b]Each hospital's average LOS is weighted by Medicare discharges.
[c]Each hospital's average LOS is weighted by total discharges.
[d]Median value used.

Source: Calculations on Medicare Cost Report Data (HCRIS: PPS1, PPS5).

Overall volume declines were offset by increases in casemix in winner hospitals, increasing 6.1 percent from PPS1 to PPS5. On average, winners offset the revenue-reducing effects from volume declines with revenue-enhancing casemix increases before any PPS updates. Drastic Medicare volume reductions in loser hospitals were only partially offset by a 5.8 percent increase in casemix. Thus, losing hospitals experienced a 5 percent (5.8% - 21.1%) decline in Medicare revenues before PPS updates are factored in.

Occupancy rates were much higher in winners (59 and 58 percent in PPS1 and PPS5) compared to losers (48 and 44 percent in PPS1 and PPS5). But volume declines and bed vacancies were not matched by significant bed reductions. In particular, average bed size among losers only fell from 78 to 73 from PPS1 to PPS5 despite drastic volume declines and low occupancy rates. Winners, too, reduced bed size but only from 175 to 166 beds over this period.

4.5 Cost Performance

Differences in hospital efficiency is partially captured by average costs per day and per discharge. Table 4-5 compares average cost (adjusted for Medicare casemix, the HCFA wage index and regional cost of living differences) for Medicare and all inpatients for winners and losers. Average inpatient costs per day and per discharge were lower in winner hospitals than in losers, both in total and for Medicare and in PPS1 as well as PPS5. Average total cost per Medicare discharge in PPS5 was $4,019, on average, in loser hospitals versus only $3,037 in winner hospitals. Losing hospitals experienced double the rate of cost growth compared with PPS winners. Much of the differential in costs between the two groups may be due to the differences in relative volume declines.

Routine costs per day and per discharge, in total and for Medicare, were much higher in loser hospitals. For example, routine cost per discharge in PPS5 was $1,188 in losers and $853 in winners, a 40 percent difference. Consistent winners have always experienced lower Medicare routine costs over the PPS period, but during the first five years the gap doubled. This is certainly due to the failure of losing hospitals to cut fixed routine expenses (plus allocated overhead) in the face of 20 percent declines in Medicare volume.

TABLE 4-5

AVERAGE TOTAL INPATIENT AND MEDICARE COSTS PER DAY AND PER DISCHARGE FOR CONSISTENT PPS WINNERS AND LOSERS: PPS1 VS. PPS5

	CONSISTENT LOSERS			MIDDLE			CONSISTENT WINNERS		
			Percent Change			Percent Change			Percent Change
Inpatient Costs[a]	PPS1	PPS5	PPS1--5	PPS1	PPS5	PPS1--5	PPS1	PPS5	PPS1--5
Total									
Cost per day	$ 386	$ 537	39.2%	$ 354	$ 447	26.3%	$ 359	$ 431	20.1%
Cost per discharge	2,248	2,975	32.4%	2,164	2,599	20.1%	2,048	2,359	15.2%
Medicare									
Cost per day	344	508	47.6%	305	412	35.1%	307	395	28.8%
Operating Cost/day[b]	339	438	29.3%	298	358	20.0%	292	340	16.5%
Cost per discharge	2,946	4,019	36.4%	2,753	3,340	21.3%	2,581	3,037	17.7%
Oper'g cost/disch[b]	2,637	3,517	33.4%	2,446	2,943	20.3%	2,249	2,643	17.5%
Routine[a]									
Total									
Cost per day	179	236	32.0%	156	185	18.8%	153	177	15.1%
Cost per discharge	990	1,188	20.0%	883	984	11.4%	799	853	6.8%
Medicare									
Cost per day	179	235	31.2%	156	184	18.0%	151	171	13.1%
Cost per discharge	1,288	1,661	28.9%	1,173	1,371	16.9%	1,064	1,180	10.9%
Intensive Care Unit[a]									
Total									
Cost per day	721	865	19.9%	651	737	13.4%	734	844	15.0%
Medicare									
Cost per day	452	521	15.5%	409	436	6.6%	407	420	3.3%
Ancillary[a]									
Total									
Cost per day	218	337	54.5%	205	291	41.6%	217	288	32.6%
Cost per discharge	1,247	1,790	43.5%	1,230	1,637	33.1%	1,201	1,518	26.3%
Medicare									
Cost per day	169	215	27.4%	158	194	22.9%	161	191	18.5%
Cost per discharge	1,274	1,664	30.5%	1,274	1,532	20.2%	1,209	1,426	18.0%

[a]Adjusted by casemix, HCFA labor price index, and cost of living. The HCFA labor price (wage) index is based on cross-sectional data and does not change annually.

[b]Excludes PPS passthroughs.

Notes: Consistent losers and winners defined as those hospitals in the lower or upper quartiles for PPS3, PPS4, and PPS5.

Source: Calculations on Medicare Cost Report Data (HCRIS: PPS1, PPS5).

We also examined total and Medicare ancillary costs per day and per discharge. On average, costs were similar in both groups in PPS1 after adjusting for casemix, but over time costs in consistent losers increased more rapidly (30.5 versus 18.0 percent for Medicare ancillary costs per discharge).

Values for every cost measure indicate greater relative efficiency in winning hospitals vis-a-vis loser hospitals both at the beginning of PPS and particularly after five years. These numbers do not enable us to ascertain the source of apparent inefficiency (e.g., scale, scope, technical and allocative) between the groups, but large volume declines in losing hospitals suggest significant scale inefficiencies are raising their costs and turning any PPS gains in the earlier years into consistently large losses.

4.6 Labor Productivity Difference

Analyses of trends in hospital labor resources juxtaposed to volume and intensity changes may reveal potential hospital inefficiencies (technical, allocative). Table 4-6 presents an empirical analysis of hospital labor trends. There was a strong trend toward greater RN utilization everywhere over the first five years of PPS. Losing hospitals increased RNs by 6.8 percent from 45 to 48 FTEs, inspite of huge volume losses, while winners raised their number of RNs by 14.6 percent (145 in PPS1 to 166 in PPS5). By contrast, lower skilled nurses--LPNs and ancillary nurses--were reduced in absolute numbers. FTE LPNs fell by 20.6 percent in losing hospitals, 11.7 percent in the middle group of hospitals, and 5.9 percent in winning hospitals. Ancillary nurse FTEs fell by 13.7 percent in losing hospitals but increased by 5.9 percent in winning hospitals. Overall, total nurse employment fell 4.9 percent in losing hospitals while actually increasing by 9.2 percent in winning hospitals.

In spite of large inpatient volume declines, total FTEs increased slightly (0.6 percent) in consistent losers while total FTEs in consistent winners grew by 10.4 percent.

Trends in nursing employment led directly to increases in nursing skillmix. For example, the ratio of RNs to LPNs, adjusting for casemix, increased by 45 percent from 3.2 to 4.6 in losing hospitals while winning hospitals show a marginally slower increase of

TABLE 4-6

LABOR PRODUCTIVITY TRENDS BETWEEN CONSISTENT PPS WINNERS AND LOSERS: PPS1, PPS5

	CONSISTENT LOSERS			MIDDLE			CONSISTENT WINNERS		
Labor Inputs	PPS1	PPS5	Percent Change PPS1--5	PPS1	PPS5	Percent Change PPS1--5	PPS1	PPS5	Percent Change PPS1--5
Nurse FTEs									
RN	45	48	6.8%	138	154	11.8%	145	166	14.6%
LPN	20	16	-20.6%	41	36	-11.7%	41	38	-5.9%
ANC	24	21	-13.7%	51	49	-4.6%	49	52	5.9%
Total	89	85	-4.9%	231	240	3.9%	235	257	9.2%
Total FTEs	220	222	0.6%	591	630	6.5%	639	705	10.4%
Nursing Skill Mix									
RN/LPN[a]	3.2	4.6	44.9%	6.0	9.3	55.2%	5.4	7.4	36.6%
RN/LPN[b]	3.26	5.61	72.1%	4.82	7.14	48.1%	4.44	5.68	28.0%
RN/(LPN,ANC)[a]	1.3	1.7	23.6%	2.0	2.5	27.2%	2.1	2.9	36.2%
RN Productivity[a]									
Days/RN	358	279	-21.9%	372	311	-16.4%	354	314	-11.2%
Discharges/RN[a]	63	53	-16.8%	62	55	-11.3%	63	59	-6.4%
FTE Nurse Productivity[b]									
Days/FTE nurse[a]	170	143	-16.2%	177	159	-10.3%	169	161	-4.8%
Discharges/FTE nurse[a]	30	27	-10.8%	29	28	-4.8%	30	30	0.4%
Other Productivity									
Total FTE/BED	2.79	3.03	8.7%	3.15	3.60	14.4%	3.63	4.20	15.9%
Total FTE/Occupied Bed	5.05	6.20	22.7%	4.83	5.74	18.8%	5.43	6.32	16.4%
Capital ($)/Total FTE[c]	$3,439	$6,023	75.2%	$3,977	$5,538	39.3%	$3,482	$4,738	36.1%
Capital Spending ($1000s)[c]	$725	$1,220	68.3%	$2,360	$3,531	49.6%	$2,132	$3,237	51.8%

Note:

Losers and winners defined as those hospitals in the lower or upper Medicare margin quartiles for PPS3, PPS4 AND PPS5.

[a]Case-mix adjusted.

[b]LPN and ancillary nurses are converted into RN FTEs using relative wages: (PPS1) FTE_LPN = 0.613*FTE RN; FTE_ANC = 0.485. For PPS5, FTE_LPN = 0.544*FTE_RN; FTE_ANC = 0.412*FTE_RN. Source: Pope (1990).

[c]Deflated by a capital price deflator using Swift & Marshall data.

Sources: Cromwell, J. and B. Butrica (1991); calculations on Medicare Cost Report Data (HCRIS: PPS1, PPS5).

36.6 percent in the RN to LPN ratio. The RN to LPN-plus-ancillary-nurse ratio, adjusted by the CMI, grew by 23.6 percent in losing hospitals, and captures the declining trend in employment for both LPNs and ancillary nurses. In contrast, winning hospitals had an even larger increase (36.2 percent) because of the rapid growth in RN employment.

RN productivity, in terms of casemix-adjusted days or discharges, fell from PPS1 to PPS5. The steepest declines occurred in losing hospitals where casemix-adjusted days per RN fell from 358 in PPS1 to 279 in PPS5 (or 21.9 percent). RN productivity was actually higher for losing hospitals at the beginning of PPS, but this advantage reversed by PPS5 (279 days per RN versus 314 among winners). Some of the reductions in days per FTE RN is attributable to PPS incentives to shorten lengths of stay and eliminate inappropriate admissions and days because of PRO oversight.

RN productivity trends can be misleading because of the shift towards a more RN-rich nurse skill mix. Total nurse productivity was analyzed using weighted LPN and ancillary nurse measures. Relative wage rates were used to convert LPNs and ancillary nurses to RN-equivalents. Holding volume constant, dropping one LPN and one ancillary nurse was equivalent to losing one RN, based on relative wages. Productivity values using full-time, RN-equivalent, nurses were derived in terms of days and discharges, both adjusted for casemix. Again, productivity declined for consistent losers (-16.2 and -10.8 percent for days and discharges, respectively). Inpatient days per total FTE nurse declined by only 4.8 percent for consistent winners while discharges per total FTE nurse increased slightly (0.4 percent), implying positive nurse productivity growth.

Trends in FTE nursing employment, skill mix, productivity, and volume are consistent with the rising costs incurred by consistent losers and imply increasing scale inefficiency. By contrast, winning hospitals maintained high PPS profits by raising nurse productivity on a casemix-adjusted per discharge basis. This was made easier by the relative constancy of discharges vs. a 20 percent decline among losing facilities.

In addition to nurse productivity, we explored other broader measures of hospital productivity. Total FTEs per bed grew nearly twice as fast in winners than in losers

(15.9 versus 8.7 percent), but after adjusting for declining occupancy, the trend was reversed. Consistent losers were unable to bring employment in line with a falling average daily census.

Labor productivity depends, in part, on the amount of capital workers have at their disposal. At the beginning of PPS, consistent PPS winners and losers had nearly identical capital/labor ratios. (For this analysis, capital stocks are proxied by depreciation and interest expenses which may not accurately reflect capital stocks for fully depreciated assets or those purchased with equity.) Over the PPS period, consistent losers greatly increased their capital expenditures (68.3 percent) as did winners (51.8 percent). If this higher capital/labor ratio improved productivity, it is not reflected in any of the comparative productivity indicators. Discharges per FTE nurse fell faster and FTEs per occupied bed rose faster among losers than among winners. It is possible that losers needed to make greater investments in building renovation and equipment in order to be more competitive, but in retrospect their volume performance did not justify the expenditure -- at least through PPS5.

5.0 EFFICIENT HOSPITALS AND THE PPS UPDATE

Chapter 4 shed light on the characteristics of winning and losing hospitals based on PPS profits. Inspection of these groups is valuable in that it shows their financial needs and who has faired well or poorly. The results have also supported the hypothesis that losing hospitals were "out-competed" and became increasingly inefficients their inpatient volumes declined. A limitation of the analysis, however, was the confounding of cost and productivity performance with PPS payment methods. A hospital could be a consistent financial winner under PPS without necessarily being low cost.

This chapter reorients the analysis away from a comparison of costs of PPS winners and losers to a comparison of PPS profits and productivity among PPS low and high cost facilities.

5.1 Background

The PPS standardized amounts that are published annually by HCFA in the Federal Register form the basis of Medicare payments to hospitals. These amounts are based on 1982-3 hospital average costs that have been trended forward using the PPS update factors. As averages, they contain the costs of both efficient and inefficient hospitals in the base period. It is believed that cost-based reimbursement permitted a great deal of inefficiency, assuming that the majority of hospitals were not cost-minimizers (or profit maximizers).

The standardized amounts have been updated annually now for many years using the HCFA market basket of input prices as a starting point and adjusting upwards or downwards in response to industry performance. With the exception of rural hospitals in 1990 and 1991, actual updates have been below the market basket, and hospital costs in general have exceeded the updates by several percentage points each year. Cost inflation so much above input price inflation has renewed concerns that inefficient behaviors have not been entirely eliminated from hospital management.

The original intent of PPS was to start with actuarially fair standardized amounts that would reward the efficient and penalize the inefficient (see Fig. 3-1). Constrained updates should put further pressure on inefficient hospitals to reduce (or control) costs. Now that PPS

margins have turned negative, however, pressures build to raise the update factors. On the other hand, if some perpetual inefficiency remains in the system, higher updates would reward the inefficient as well as the efficient.

There are reasons to believe inefficiencies remain in the system even after eight years under prospective payment. First, PPS has paid teaching and other specialized hospitals more than may be necessary to break even. Second, hospitals derive only a part of their revenues from Medicare and may have continued to subsidize inefficiencies through private payers. Third, as nonprofit institutions for the most part, there is no reason to expect hospitals to minimize costs even over the long run. Substantial financial and psychic costs are incurred by management in "getting the most out of its inputs", and the absence of a price competitive market may allow managers to be less than perfectly efficient. Managers do not have omnipotent control over physicians either, which constrains their ability to minimize costs.

Inefficiencies can be categorized into five areas. Hospitals may be allocatively inefficient in, say, employing too rich an RN nursing mix. Clinical inefficiency could also include the overuse of, say, diagnostic testing. They may be technically inefficient in failing to insure that the input mix is as productive as possible. They may be scale inefficient if volumes have fallen and inputs have not been scaled back. And they may be scope inefficient in offerring too broad a service mix that has negative spillover effects on other services, e.g., requires too many overhead managers to coordinate services.

If some (many) hospitals are perpetually inefficient for one reason or another, then negative PPS margins, averaged across all facilities, are not sufficient grounds for higher PPS updates. This argument is even more true if excess capacity remains in the system. Continued low updates would not hurt efficient, low cost, hospitals but would eventually force inefficient, high cost, hospitals to cut costs, close, or merge with a more efficient operation.

5.2 The Problem of Identifying Efficient Hospitals

The problem, then, is to identify a reference set of efficient hospitals to use as a benchmark in setting future updates. Efficiency requires cost minimization for a

specified level of output. For a given set of input prices, a dual relationship exists between cost and production efficiency such that cost minimization requires achieving the maximum possible output for a fixed set of inputs. Theory predicts, therefore, that hospitals achieving high productivity should simultaneously exhibit low average costs per case.

Several problems arise in empirically measuring efficiency. First, output is ill-defined in hospitals. Even inpatient care is poorly measured simply by a head count of discharges. DRGs partially capture the severity of patients upon admission, but they fail to measure hospital output in two important ways. For one, they ignore severity differences within DRGs. Some hospitals may admit systematically sicker cancer, heart, or orthopedic patients. For another, DRGs say nothing about patient outcomes. Value-added in production is the preferred output measure in measuring industry performance. By simply counting all discharges and weighting them by DRG relative values, one implicitly assumes that each hospital treats its patients equally well. But value-added is not equivalent in two hospitals with the same casemix index that differ in 30-day post admission mortality rates, assuming within-DRG severity was identical upon admission. Nor is the value-added of treating a malignant brain neoplasm necessarily "worth" more at a DRG relative weight = 1.28 than the setting of three fractured ribs as part of major chest trauma, DRG weight = .96. Treating the neoplasm costs more, but whether the ultimate value is 33 percent greater to patients or society is highly debatable. As we will show later when comparing low and high cost hospitals, this is not an academic point. Treating terminal cancer patients can be a very expensive process; yet, it is not at all clear that a hospital specializing in cancer care is adding more value per discharge than one specializing in, say, trauma or pediatric care.

A crucial, and related, point is the systematic variation in aggressivity of care. Some hospitals employ a panoply of diagnostic and therapeutic services to isolate rare diseases and treat serious problems. Presumably, these hospitals produce greater value-added for very sick patients than less technologically endowed community hospitals. DRGs certainly reflect much, but not all, of such differences.

A different problem with hospital output is that it is not unidimensional. Hospitals treat inpatients and outpatients. Some teach. Some provide community education programs. Some provide home health, hospice, and durable medical equipment services. These activities consume resources, but unless their outputs are captured as well, productivity will be understated and costs per unit of output overstated. Economists' standard approach in other industries with product variety is to use total sales as a price-weighted index of multiple outputs. Sales, or revenues, are unacceptable output measures for hospitals, however, when patients pay only 5 percent of the bill. Eliminate insurance and the value-added of hospitals would fall tremendously in general and for some hospitals in particular where patients couldn't afford to pay.

Then there are the cost data. HCFA's Medicare Cost Reports are not designed to capture costs at the patient level, and strong assumptions must be made in allocating direct and indirect costs using patient charges. Nor are the cost reports always accurate. Costs can be mis-allocated by hospital accountants, errors are made in posting costs, and discharges mis-reported. As a result, the Medicare Cost Report file includes hospitals reporting over $1 million per discharge! Great care must be taken in selecting efficient hospitals based on low average costs when this is exactly the group that is most likely to have mis-reported data (i.e., missing costs or too many discharges).

5.3 Adjusted Costliness as a Measure of Efficiency

Medicare inpatient costs per discharge, properly adjusted, is one indicator of hospital efficiency. It is also used in calculating hospital margins which are the focus of public debate on the generosity of Medicare reimbursement.

Medicare Cost Reports covering the first five years of prospective payment were used to construct a measure of Medicare inpatient non-passthrough costs per case. Medicare costs are taken from Worksheet D-1, line 50 (in PPS5) and represent the sum of program general inpatient routine, intensive care, ancillary service, and malpractice costs. From this total has been subtracted all Medicare capital (F376) and medical education (F440) passthrough costs

reported elsewhere on Worksheet D. (F numbers identify specific variables in HCFA's Hospital Cost Report Minimum Data Set.)

Medicare costs vary across facilities for legitimate reasons, most important of which are casemix and input prices. To adjust for these factors, each year's Medicare costs were divided by the following adjustment:

$$ADJ_t = CMI_t*[a*WI88 + (1-a)*COLA]$$

where

CMI_t = Medicare DRG casemix index in year t,

WI88 = HCFA's 1988 geographic hospital wage index,

COLA = area cost of living index used to account for higher nonlabor prices in Alaska and Hawaii, and

a = the fraction of costs assumed to be labor related (= .70).

Casemix indexes are based on 1982-3 data, and costs are standardized to the reported casemix for that year. For example, a hospital with a CMI = 1.10 in PPS5 will have its costs reduced 10 percent, and 10 percent of its cost inflation can be explained by the increasing costliness of its inpatient casemix. Over time, the average CMI has risen well above its original 1.0, resulting in a negative cost adjustment for most institutions. Cross-section variation remains, however, with some hospitals exhibiting CMIs less than .80 in PPS5 while a few are above 1.70.

DRG creep results in an overstatement of the increase in casemix severity. By focusing on relatively costly hospitals in later years, the underlying trend in upcoding is factored out. If some hospitals arbitrarily increased their DRG coding faster than others, they may appear to be less costly in future years than they truly are. The extent of this error is unknown, but not thought to be an important reason why hospitals were deemed to be consistently low cost.

The following figures give a range of adjustments applied to the cost data:

CMI	WI88	COLA	ADJ
.80	.60	1.0	0.58
1.00	1.00	1.0	1.00
1.25	1.10	1.0	1.34
1.50	1.30	1.0	1.82

Costs in the first case would be raised by 1/.58, or 72 percent while those in the fourth case would be reduced by 1/1.82, or 55 percent. Thus, between small, rural, hospitals with very simple casemixes and large urban hospitals treating costly cases in expensive cities, the adjustment can be as great (or greater) than a factor of 3.

Note that the CMI adjustment assumes a constant proportional effect. If the CMI is twice as high, costs are reduced by 50 percent. Any diseconomies of scope as casemix severity rises would remain in the adjusted cost figures.

Ideally, we would also like to adjust for within-DRG casemix severity. We would also like to adjust for geographic variation in nonlabor input prices for more than just Alaska and Hawaii. Data for such adjustments were unavailable.

After adjusting for casemix and wages, the data were trimmed. All rural hospitals with adjusted Medicare inpatient costs more than $15,000 per discharge or less than $800 were excluded. All urban hospitals with adjusted costs above $18,000 or below $1,000 per discharge were similarly dropped. Finally, all hospitals with less than 10 Medicare discharges in PPS3, 4, or 5 were excluded. The combination of missing wage indexes, CMIs, and outlier trims resulted in less than 100 hospitals being discarded.

5.4 Identifying Efficient, Low Cost, Hospitals

Two approaches were used to identify efficient, low cost hospitals.

5.4.1 Adjusted Costs Per Case

Under the first approach, adjusted Medicare inpatient operating costs per discharge were used as the criterion variable, and all hospitals in PPS periods 3, 4, and 5 were categorized into the lowest, middle two, and highest quartiles. Then a reference set of low cost hospitals was identified whose costs fell into the lowest quartile in all three periods. A comparison set of high cost facilities was so defined based on the highest quartile. The middle group comprised all hospitals that did not consistently fall into either the low or high groups. Of the 4,203 hospitals with reported cost and other information (e.g., parfits, RNs) over this

period, 696 fell into the low cost group; 619 were in the high cost group; and 2,888 fell into the residual, middle group. Thus, roughly 17 percent of hospitals had consistently low costs versus 15 percent with consistently high costs over three years.

5.4.2 Regression Cost outlier Approach

A second approach based on regression analysis was also used that was more sensitive to systematic cost differences among hospital groups. Two hospitals in the same city could have similar Medicare casemix indices yet very different costs because of the style of care provided. Cancer is a good example. One hospital could treat malignant colon cancer very aggressively while another may provide only palliative care. Previous research (Cromwell et al., 1987) has shown dramatic differences in hospital costs that are partially explained by the more intensive physician services patients receive. Systematic differences were found between urban and rural, small and large, teaching and nonteaching, hospitals.

The regression specification was the following:

$$TC\_DISM3 = f[JREGION; JBEDS; JTEACH] + \epsilon$$

where

TC_DISM3 =	Medicare total operating costs per discharge, adjusted for casemix and wages;
JREGION =	dummy variables for the nine Census Divisions;
JBEDS =	dummies for ten rural-urban bedsize categories;
JTEACH =	dummies for nonteaching, minor (<25 residents per 100 beds), and major teaching; and
ϵ =	residual error term.

This equation was estimated separately for PPS3,4, and 5. Hospitals were then classified as low or high cost based on their residual value always being in the lowest or highest quartile over three years.

Because all included variables are categorical, this regression approach is equivalent to an unnested peer group approach. Over-500 bed major teaching hospitals in New England are

being compared to themselves in that their residual is calculated holding average costs of over-500 bed, urban, major teaching, and New England hospitals constant. For example, the predicted value for under-50 bed rural, nonteaching hospitals in the South Atlantic was $2,352 in PPS3 versus $2,852 for an under-100 bed urban nonteaching hospital in the same region. This is a 22 percent difference even after adjusting for casemix and wages. The highest "peer group" cost (= $4,185 in PPS3) was for over-500 bed urban major teaching hospitals in the Pacific division.

Using the regression approach to defining low and high cost hospitals implicitly assumes that regional, bedsize, urban-rural, and teaching differences in costliness, over-and-above casemix and wages, are legitimate. Except for the PPS transition period, this assumption has been rejected for region, bedsize, and more recently for urban-rural location. Teaching differences have already been reflected in payment differences. As shown below, which method is used to identify low cost "efficient" hospitals makes a big difference in the composition and performance of the reference set.

5.5 Who Are the Efficient, Low Cost, Hospitals?

5.5.1 Cost Groups Stratified by Hospital Characteristic

Table 5-1 reports frequencies of the three cost groups stratified by key hospital characteristics. Four-fifths of low cost facilities are in rural areas, even after adjusting for casemix and local wages. A strong bedsize effect is also evident as well. Nearly 90 percent of all low cost hospitals are either rural with under 50 beds or urban and under-100 beds. No "efficient" hospitals in urban areas had over 405 beds, and only 41 of over 2,000 urban hospitals were low cost and over 100 beds. By contrast, the urban-rural frequency is reversed among high cost hospitals.

Government (nonfederal) hospitals are more likely to appear among low than high cost facilities while proprietary hospitals are more likely to be high than low cost.

Only 2 major teaching hospitals in the sample were consistently low cost versus 89 that were consistently high cost. Teaching hospitals, in general, are nearly 20 times more likely

TABLE 5-1
HOSPITAL CHARACTERISTICS OF CONSISTENTLY LOW, MEDIUM, AND HIGH MEDICARE ADJUSTED-COST HOSPITALS: PPS5

	LOW345		MID345		HIGH345	
	%	N	%	N	%	N
All Hospitals	100.0	676	100.0	3,330	100.0	668
Rural	78.6	531	52.3	1,740	18.1	121
< 50 Beds	51.8	350	23.1	769	10.5	70
50-99 Beds	20.0	135	17.2	574	3.9	26
100-169 Beds	5.8	39	7.6	254	2.1	14
> 169	1.0	7	4.3	143	1.7	11
Urban	21.5	145	47.8	1,590	81.9	547
< 100	15.4	104	10.9	364	13.3	89
100-199 Beds	4.6	31	15.3	508	23.2	155
200-299 Beds	0.9	6	10.7	355	18.6	124
300-404 Beds	0.6	4	6.3	209	12.0	80
405-504 Beds	0.0	0	2.8	94	5.5	37
> 504 Beds	0.0	0	1.8	60	9.3	62
Control						
Voluntary	48.8	330	55.9	1,862	53.9	360
Proprietary	9.8	66	15.7	522	22.3	149
Government	41.4	280	28.4	946	23.8	159
Teaching Status						
Nonteaching	97.8	661	85.3	2,839	57.9	387
Minor Teach	1.9	13	13.9	461	28.7	192
Major Teach	0.3	2	0.9	30	13.3	89
Disproportionate Share						
Not Qualified	83.9	567	77.6	2,584	51.5	344
Urban > 100 Beds	3.0	20	16.2	538	43.4	290
Urban < 100 Beds	2.1	14	1.4	47	3.6	24
Rural	11.1	75	4.8	161	1.5	10
Payment Status						
Other Rural	73.1	494	40.3	1341	10.8	72
Sole Community	4.4	30	7.2	239	5.4	36
Rural Referral	1.3	9	5.2	173	2.4	16
Other Urban	21.2	143	47.4	1,577	81.4	544
Region	100.0	676	100.0	3,330	100.0	668
New England	1.0	7	3.1	103	2.3	15
Middle Atlantic	1.9	13	4.7	157	5.8	39
South Atlantic	11.2	76	15.5	516	16.0	107
East North Central	14.5	98	17.2	573	20.5	137
East South Central	16.7	113	9.2	305	4.8	32
West North Central	27.8	188	14.6	486	6.7	45
West South Central	13.0	88	16.0	534	17.7	118
Mountain	8.6	58	7.1	235	5.5	37
Pacific	5.2	35	12.6	421	20.7	138

Source: PGM=B0780WS.HPCPIE2.LIB(JC10)
Note: Low345 = Hospitals in the lowest quartile of case mix and wage adjusted Medicare costs per discharge in PPS3, 4, and 5; MID345= Hospitals in the mid-quartile range and HIGH345= Hospitals consistently in the highest quartile.

to be high than low cost, even after adjusting for their more expensive casemix and higher urban wages.

Practically the only hospitals equally likely to be high or low cost were Sole Community hospitals and Rural Referral Centers. The former tend to be smaller, isolated, hospitals that should be more inclined to have low costs while RRCs should be higher cost because of their more costly set of services.

Very strong regional differences exist. South Atlantic and East North Central hospitals are 1.4 times more likely to be high than low cost; Pacific hospitals nearly 4 times more likely to be high cost. East South and West North Central hospitals were much more likely to be low cost facilities.

5.5.2 Analysis of Variance

Analysis of variance was performed to test for the effects of four hospital characteristics on the variation in Medicare adjusted costs per discharge: Census Division; urban-rural by bedsize; teaching status; and control. The results are shown in Table 5-2. The top panel gives the explanatory power of each stratum for fully adjusted costs (TC_DISM3) while the bottom panel reports comparative results for costs unadjusted for casemix or geographic wage differences (TC_DISMU).

The four strata together explain 55 percent of the variation in unadjusted costs versus only 15.2 percent after casemix and wages are accounted for. The Type I sum of squares gives the explanatory power of each variable as it is stepped into the equation with region entering first followed by beds/urban-rural, teaching, and control. Type III sums of squares are more meaningful as they reflect each stratum's explanatory power holding all other strata constant. Then F-statistics indicate that every stratum statistically contributes to the variation in costs. Teaching status is a very powerful variable, explaining 2.9 percent of the variation in adjusted costs using only three values: non, minor, and major teaching. Bedsize by urban-rural location explains as much of the variation in costs as teaching status while region is slightly less powerful. Control is much less so, albeit still statistically significant.

Small hospitals are clearly less costly on average than larger hospitals. A comparison of Type I and Type III sums of squares confirms that some of the difference, however, is due to the nonteaching orientation of small hospitals and some to their nonrandom location in less

TABLE 5-2
ANALYSIS OF VARIANCE OF PPS5 ADJUSTED VERSUS UNADJUSTED MEDICARE COSTS PER DISCHARGE

Dependent Variable Strata	TYPE I Sum of squares % SS Explained	TYPE I Sum of squares F	TYPE III Sum of squares % SS Explained	TYPE III Sum of squares F	R (DOF)	Mean (C.V.)
TC_DISM3					0.152 (4,671)	$3,101 (30.2)
REGION	4.0%	27.3%	1.9%	12.9%		
BEDS/UR	7.5	46.1	2.9	17.9		
TEACH	2.9	79.6	2.9	80.3		
CONTROL	0.7	20.1	0.7	20.1		
TC_DISMU					0.546 (4,819)	$3,637 (28.8)
REGION	16.1	212.0	6.6	86.8		
BEDS/UR	34.2	400.0	16.2	18.8		
TEACH	3.8	201.9	4.0	210.4		
CONTROL	0.5	17.1	0.5	17.1		

Definitions:

TC_DISM3 = Medicare inpatient costs per discharge, adjusted for medicare CMI, area wage index, and nonlabor cost of living

TC_DISMU = Unadjusted Medicare inpatient costs per discharge

REGION = 9 census divisions

BEDS/UR = 10 bedsizes by urban-rural locations (4 rural; 6 urban sizes).

TEACH = 3 teaching categories (proprietary; public; private voluntary).

DATA TRIMS = Excludes rural hospitals with $800 < average cost , $15,000 and urban hospitals with $1,000 < average costs < $18,000. Also excludes all hospitals with < 10 Medicare discharges.

PGM = BO78WS.HPCPIE2.LIB(JCO4)

expensive regions of the country. This is noted by the large decline in sums of squares once teaching is stepped in. A large part of the regional variation in adjusted Medicare costs per discharge is attributable to bedsize, urban-rural location, and teaching status, all three of which are unequally distributed around the country.

5.5.3 Utilization Statistics

Low cost hospitals are far smaller than more costly hospitals, as shown in Table 5-3. They average only 59 beds and roughly 2,000 discharges annually versus 235 beds and almost 8,600 discharges among high cost institutions.

Low cost hospitals are also much more dependent on Medicare. Slightly more than 4-in-10 discharges are covered by Medicare in low cost facilities versus 3.3-in-10 in high cost hospitals. The disparity in days is even greater: 6-in-10 days are Medicare in low cost hospitals versus 4.5-in-10 in high cost hospitals.

Low cost hospitals treat a far less costly Medicare caseload than high cost hospitals (roughly 15% less). Consequently, they experience a shorter length of stay. Even when adjusted by the Medicare casemix index, however, low cost hospitals experience 5.6 Medicare days per discharge versus 7-7.2 days in high cost hospitals. Hence, the DRG classification of patients does not completely account for the longer stays in high cost hospitals and may be indicative of patient management inefficiencies.

Table 5-3 reports one unexpected result and that is the lower occupancy rate in low cost hospitals. (Recall that PPS winning hospitals had higher occupancy rates.) Not only are low cost hospitals much smaller, their beds are utilized less intensively. This difference, however, is an artifact of their shorter stays. If low cost hospitals experienced the longer stays of high cost hospitals, their occupancy rate would be several points higher than that of more costly hospitals. Rapid bed turnover is a source of their efficiency and lower costs; a fact not reflected in occupancy rates. (See Section 5.10 for further discussion.)

TABLE 5-3
UTILIZATION STATISTICS OF CONSISTENTLY LOW, MEDIUM, AND HIGH MEDICARE ADJUSTED-COST HOSPITALS: PPS3 AND PPS5

	LOW345		MID345		HIGH345	
Utilization	PPS3	PPS5	PPS3	PPS5	PPS3	PPS5
Total Discharges	2,012	1,905	5,234	5,122	8,575	8,608
Medicare Discharges	728	725	1,723	1,734	2,351	2,320
Total Inpatient Days	9,080	8,680	29,226	28,457	55,624	53,867
Medicare Days	4,586	4,541	13,708	13,781	21,908	21,348
Medicare Share of:						
Discharges	0.41	0.43	0.38	0.39	0.33	0.34
Days	0.56	0.60	0.52	0.55	0.44	0.46
Average Length of Stay *(a)*	4.16	4.18	4.55	4.57	5.52	5.60
Medicare Length of Stay *(a)*	5.65	5.60	6.22	6.21	7.21	6.97
Case-Mix Index	1.07	1.07	1.16	1.17	1.23	1.25
Bedsize	59	59	144	141	241	233
Occupancy Rate	0.50	0.51	0.52	0.53	0.58	0.58
Outpatient Visits	13,616	16,236	34,836	41,225	68,539	80,201

Source: PGM=B0780WS.HPCPIE2.LIB(JC10)

(a) Adjusted by Medicare casemix index.

5.6 Are Low Cost Hospitals Uniformly Less Costly Within Cost Center?

One way of isolating the factors behind hospital cost differentials is to focus on cost components that can be constructed from Medicare Cost Reports. Table 5-4 shows a breakdown of costs by component for the three hospital cost groups. Costs are decomposed in several ways: Medicare vs. total costs; costs per day vs. per discharge; and routine, ancillary, and ICU. All costs are after stepdown of general overhead (excluding capital and medical education).

Relatively minor differences (=30%) in routine per diem costs exist between low cost and other hospital cost groups; at least after adjusting for casemix and wages. Much larger differences (76%) in routine costs exist on a per stay basis, which is consistent with length of stay differences. Medicare in high cost facilities "picks up" more of routine costs when costs are accumulated across stays.

Ancillary and ICU cost differences for Medicare patients are even larger, both on a per day and per stay basis. High cost hospitals incur roughly 60 percent more ancillary costs per Medicare day than lower cost hospitals. Factoring in their longer stays, high cost hospitals are roughly 120 percent more expensive in the use of ancillary services. ICU costs per ICU day are not very different, but high cost hospitals spend over 200 percent more (or double) per stay in the hospital on ICU treatment. Low cost hospitals average slightly less than 0.4 ICU days per discharge (not shown in table) versus 1.13 ICU days per discharge in high cost hospitals, a 3-fold difference. Only 50 percent of low cost hospitals even provided ICU care in PPS5 versus almost 90 percent of high cost facilities. Nevertheless, when low cost hospitals offer ICU care, it is still considerably less expensive per discharge ($393 in PPS5 vs. $647 casemix adjusted), both because daily ICU costs are less and patients spend fewer days in the ICU.

5.7 Are Low Cost Hospitals More Productive?

Low cost hospitals, after adjusting for casemix, discharge patients sooner and provide less ICU and ancillary care, but are they more productive? Table 5-5 provides a few labor productivity statistics that shed further light on the efficiency of low cost hospitals.

TABLE 5-4
COMPARISON OF LOW, MEDIUM, AND HIGH MEDICARE ADJUSTED-COST HOSPITALS BY COST COMPONENET: PPS3 AND PPS5

STANDARDIZED COSTS	LOW345		MID345		HIGH345		Percent Difference High vs. Low Cost	
	PPS3	PPS5	PPS3	PPS5	PPS3	PPS5	PPS3	PPS5
Total Costs								
Day	396	462	411	481	477	556	30%	30%
Discharge	1,764	2,057	2,244	2,586	2,988	3,410	79	76
Ancillary Costs								
Day	242	305	255	314	298	357	34	27
Discharge	1,077	1,360	1,387	1,684	1,854	2,131	84	67
Routine Costs								
Day	190	217	177	204	193	223	10	11
Discharge	796	904	878	988	1,062	1,161	42	37
ICU Costs								
Day *(a)*	388	417	386	435	415	468	15	17
Discharge	94	121	184	230	308	372	237	212
Medicare Costs								
Day	307	354	335	387	389	448	37	38
Discharge	1,935	2,215	2,663	3,073	3,604	4,103	86	85
Medicare Ancillary Costs								
Day	151	172	181	209	224	256	58	60
Discharge	931	1,054	1,398	1,593	1,998	2,207	124	118
Medicare Routine Costs								
Day	188	216	177	203	192	220	12	13
Discharge	1,052	1,168	1,234	1,387	1,520	1,689	56	55
Medicare ICU Costs								
Day *(a)*	395	449	401	458	446	503	24	22
Discharge	150	183	305	369	475	570	218	212

NOTE: (1) All costs (including non-Medicare) have been standardized for the Medicare casemix and wage indexes.
(2) All statistics are weighted by the appropriate inpatient day or discharge figures.

(a) Per day in the ICU. All other per day costs reflect all days in the hospital.

TABLE 5-5
PRODUCTIVITY OF LOW, MEDIUM, AND HIGH MEDICARE ADJUSTED-COST HOSPITALS:
PPS3 AND PPS5

PRODUCTIVITY VARIABLE	LOW345		MID345		HIGH345	
	PPS3	PPS5	PPS3	PPS5	PPS3	PPS5
Nursing Skill Mix						
CMI-adjusted RN-to-NURSE	47.1%	46.0%	49.5%	49.0%	50.7%	49.3%
CMI-unadjusted RN-to-NURSE	52.9%	52.0%	62.5%	62.8%	67.4%	66.9%
Nurse Productivity						
CMI-adjusted Medicare Length of Stay (days)	5.65	5.60	6.22	6.21	7.21	6.97
CMI-adjusted INPATIENT DAYS per FTE NURSE	242.0	221.6	265.0	247.2	250.0	243.2
CMI-adjusted DISCHARGES per FTE NURSE	54.2	49.4	48.8	45.7	40.0	40.8
Other Productivity						
CMI-adjussted FTEs per BED	2.1	2.2	2.5	2.7	3.3	3.4
CMI-adjusted FTEs per OCCUPIED BED	4.3	4.6	4.3	4.6	4.8	5.0
CAPITAL per FTE	$3,824	$4,276	$4,615	$5,525	$4,636	$5,981

Notes: (1) Productivity ratios weighted total Nurse FTEs or bedsize.
(2) CMI-ADJUSTED: Medidcare length of stay, RN-to-Nurse ratio and FTEs per bed divided by Medicare casemix index while days and discharges multiplied by CMI.
(3) FTE NURSES = FTE RN + .544 * FTE LPN + .412 * FTE ANC where LPN and ancillary nurse weights reflect relative (to RN) wage rates taken from Pope (1990).

Nursing costs are generally the single largest expense in hospitals, and how this input is managed can play a large role in overall productivity. The first nursing statistic shown in the table is the ratio of RNs to all nursing staff, including LPNs and ancillary nurses. The ratio has been divided by each hospital's Medicare casemix index to adjust for patient severity. If one hospital's casemix is 20 percent more costly according to DRG mix, then its RN-to-nurse ratio should be 20 percent greater. Higher ratios, adjusted for casemix costliness, may indicate an overuse of RNs relative to the average hospital.

A systematic relationship cleary exists between the unadjusted nursing skill mix and the likelihood of a hospital being consistently low or high cost, but this difference is explained by casemix differences. The casemix-adjusted RN ratio is about 52 percent in low cost institutions versus 49 percent in high cost hospitals, a minor difference.

Two estimates of nursing productivity were constructed from a combination of MCR cost and AHA employee data. One is based on all patient days; another on discharges. (AHA data are available only on all nurses making it impossible to measure "Medicare" nursing productivity.) Both measures have been adjusted by the Medicare cost index, and RNs, LPNs, and Ancillary nurses have been converted into RN equivalents (RNEs) using relative wages (see Pope, 1990, for wage data). The general formula is

$$\text{Output/RNE} = \frac{\text{[Days or Discharges]*Medicare CMI}}{\text{RNE = FTE RNs + .544*FTE LPNs + .412*FTE ANC}}$$

wehre RNE is the RN-equivalent nurses. Hospitals with higher CMIs will show greater productivity, ceteris paribus. Hospitals substituting lower cost nurses for RNs yet producing the same casemix-adjusted output will be more productive as well.

The two productivity ratios show conflicting results. Low cost hospitals actually produce fewer days per RN-equivalent nurse than high cost hospitals. On a per discharge basis, the trend is reversed. Low cost hospitals discharge roughly 50 patients annually per RN-equivalent nurse while high cost facilities discharge only 40 patients. The simple explanation for this reversal is the 25 percent diffrence in adjusted length of stay. Another may be that casemix effects are overcounted. A more complex casemix requires longer

stays and more inpatient days. Further multiplying days by the Medicare CMI therefore overstates the true output difference on a patient days basis because longer stays already reflect much of the casemix difference. Not adjusting for casemix makes low cost hospitals appear more productive on a per day basis as well.

While low cost hospitals appear roughly 25 percent more productive than high cost hospitals on an adjusted discharge basis, i.e., 50 vs. 40 discharges per RN, trends in productivity go in the opposite direction. Between PPS3 and PPS5, nursing productivity in low cost hospitals fell about 10 percent from 54 to 50 discharges. High cost facilities saw a slight improvement in nurse productivity. Inpatient discharges continued to fall in low and medium cost hospitals between PPS3 and PPS5 while actually rising slightly in high cost facilities.

A more global productivity measure is casemix-adjusted FTEs per bed or occupied bed. Higher ratios imply lower productivity, ceteris paribus. Low cost hospitals employ about 1.2 fewer workers per bed than high cost hospitals, but when occupancy differences are factored in the differences are narrrowed considerably. By PPS5, high cost facilities were employing 5 FTEs per occupied bed versus 4.6 workers in low cost hospitals, a difference of 10 percent.

5.8 Are Low Cost Hospitals More Profitable?

Low cost hospitals should be more profitable. Not only that, but predicating PPS updates on their cost levels presumes they are already enjoying significant PPS margins and can sustain lower updates without financial loss. If all patients were being paid under a prospective DRG system and Medicare payment adjustments were perfectly correlated with cost and efficiency, then low cost facilities perforce must enjoy higher margins. The fact that Medicare is only a partial payer and that the wage, casemix, teaching, disproportionate share, and other payment adjustments to the basic standardized amounts are not grounded in efficiency measures open up the possibility that low cost facilities may not earn the highest profits.

Table 5-6 summarizes profit information according to the three cost groups. As expected, a strong inverse relation exists between Medicare costliness and PPS margins.

TABLE 5-6
AVERAGE MARGINS AND PPS PAYMENT SHARES OF CONSISTENTLY LOW, MEDIUM, AND HIGH MEDICARE ADJUSTED-COST HOSPITALS: PPS3 AND PPS5

	LOW345		MID345		HIGH345	
	PPS3	PPS5	PPS3	PPS5	PPS3	PPS5
MARGINS						
Medicare Inpatient Margin						
Mean	13.0%	14.3%	2.8%	-4.0%	-3.5%	-16.9%
Median	13.2	14.8	5.2	7.1	1.2	-13.1
Top 10%	26.0	28.3	18.5	14.6	17.4	7.9
Bottom 10%	-1.1	-0.2	-15.1	-25.4	-30.7	-50.8
Positive (%)	88.5	89.8	65.9	45.4	53.5	23.4
Total Facility Margin						
Mean	3.5%	4.2%	1.5%	1.2%	-0.3%	-3.5%
Median	8.2	4.5	3.1	2.8	2.4	0.6
Top 10%	13.1	13.8	11.7	11.3	10.3	8.6
Bottom 10%	-5.6	-5.0	-10.6	-11.7	-15.4	-22.2
Positive (%)	72.4	76.6	67.0	66.4	64.5	54.4
PPS REIMBURSEMENT SHARE FROM:						
DRGs	99.5	99.0	97.8	96.1	93.0	87.2
Outliers	0.3	0.5	1.3	2.2	3.0	5.1
Indirect Medical Educaton	0.1	0.1	0.5	0.9	2.8	4.9
Disproportionate Share	0.1	0.4	0.3	0.8	1.2	2.8

Note: Positive(%) = Number with positive margins/ total number of cases

Source: PGM=B0780WS.HPCPIE2.LIB(JC10X)

Consistently low Medicare cost hospitals in PPS5 enjoyed average PPS margins of 14.3 percent versus -.16.9 percent for high cost institutions. Nearly 90 percent of low cost hospitals at least broke even on Medicare in PPS5.

Total margins are also quite robust for low Medicare cost hospitals. Three-quarters show positive margins, and less than one-in-ten had total margins of -5 percent or less. It is interesting that over one-half of high cost hospitals still had positive total margins by PPS5. This may be explained by substantial add-ons for IME (4.9 percent of Medicare payments) and Disproportionate Share (2.8%) as well as extra outlier payments (5.1%).

5.9 Characteristics of Low Cost Hospitals based on Regression Analysis

The characteristics and performance of low cost hospitals classified using regression analysis are quite different is some respects (see Table 5-7). Whereas over half of all low cost hospitals based on adjusted costs are under-50 beds in rural areas, only 26.8 percent are low cost once region, urban-rural bedsize, and teaching status are controlled for. Previously, only 6 percent of low cost hospitals were in urban areas. Over one-third would be in urban areas based on the regression residual method. Controlling for location and teaching also raises the percent of low cost teaching hospitals from about 2 percent to 23 percent.

Regression-based low cost hospitals have 2 1/2 times more beds and Medicare discharges, a Medicare casemix 9 points higher, and a slightly higher occupancy rate. Regression-based low cost hospitals have even shorter lengths of stay and are slightly less dependent on Medicare--although still quite dependent at nearly 40 percent of all discharges.

Financially, low cost regression outliers are financially even better off, enjoying PPS5 margins of 16.2 percent vs. 14.3 percent among low adjusted-cost outliers. Total margins are also higher.

In spite of higher margins, low cost regression outliers report almost 20 percent higher adjusted Medicare costs per discharge ($2,638 vs. $2,215). This cost difference is due to (one-third) higher ancillary and (two-thirds) higher ICU costs and not to routine nursing costs, which are comparable between the two groups. It seems a strength of the low cost regression

TABLE 5-7
CHARACTERISTICS OF LOW COST HOSPITALS BASED ON TWO METHODS:
ADJUSTED AVERAGE COST VS. REGRESSION OUTLIERS
PPS5

	METHODS OF IDENTIFYING LOW COST HOSPITALS	
	ADJUSTED AVERAGE COST	REGRESSION OUTLIERS
BEDS BY LOCATION		
RURAL	51.8%	26.8%
<50 Beds	20.0	9.9
50-99	5.8	3.8
100-169	1.0	1.5
>169	15.4	19.3
URBAN		
<100 Beds	4.6	17.8
100-199	0.9	10.3
200-299	0.6	5.1
300-404	0.0	3.3
405-504	0.0	2.2
>504		
TEACHING STATUS		
Non Teaching	97.8	76.6
Minor Teaching	1.9	17.1
Major Teaching	0.3	6.3
UTILIZATION		
Medicare Discharges	725	1655
Medicare CMI-adjusted Length of Stay	5.60	5.54
Medicare Share of Discharges	0.43	0.36
Medicare Casemix Index	1.07	1.16
Bedsize	59	134
Occupancy Rate	0.51	0.56
PROFITS		
Medicare Inpatient Margin	14.3%	16.2%
Total Facility Margin	4.2%	5.1%
MEDICARE COSTS		
Operating Costs per Discharge	$2,215	$2,638
Routine Costs per Discharge	$1,168	$1,197
Ancillary Costs per Discharge	$1,054	$1,393
ICU Costs per Discharge	$183	$307
PRODUCTIVITY		
RN-to-NURSE Ratio, CMI-adjusted	46.0%	48.6%
CMI-adjusted Inpatient Days per FTE Nurse	221.6	245.9
CMI-adjusted Discharges per FTE Nurse	49.4	49.0
CMI-adjusted FTEs per Occupied Bed	4.6	4.7
Capital per FTE	$4,276	$4,858

Source: HCFA HCRIS; AHA Data Tapes.

outlier group that it is providing considerably more ancillary and ICU services for only a 20 percent increase in overall Medicare costs.

Productivity statistics (except for inpatient days per nurse) are almost identical between the two groups, but low cost regression-based outliers incur considerably more capital costs per worker and employ a slightly greater percent of RNs in their nursing staffs.

5.10 Selected Examples of Low vs. High Cost Hospitals

To better understand the reasons why hospitals differ so much on cost, we prepared a few tables (5-8-11) comparing low and high cost facilities in the same bedsize, urban-rural, location in the same state. It is not always clear why some hospitals are high cost. Woodlawn Hospital in Indiana is an under-50 bed rural hospital that appears very much like Blackford County Hospital which is low cost. The one notable difference is that Woodlawn offers ICU services, which added $405 per Medicare discharge. This does not explain all of the $1,100 cost difference, although most of the rest is in ancillary services. According to the AHA Guide Issue Woodlawn offers 15 services vs. 11 in Blackford County. Most are the same except that Woodlawn offers Diagnostic Radioisotope, blood bank, respiratory therapy, and physical therapy. Both report having an ICU, although Blackford County Medicare patients had no ICU costs in PPS5.

The presence or absence of a service, particularly an expensive ICU, can affect costs in a way not reflected in the DRG casemix. Suppose two hospitals both treat pneumonia patients, but one always admits them to an ICU for a few days while the other facility has no ICU. The DRG relative price is a weighted average of the charges in the two hospitals, including the weighted average of positive vs. zero ICU charges. When costs are compared for pneumonia patients, or any other patients that could be admitted to the ICU, we find that the hospital without the ICU is much cheaper and enjoys higher PPS margins, ceteris paribus, than the one using an ICU. Which facility is more efficient? Unless one knows the appropriateness of ICU admission or, alternatively, the improvement in health status of pneumonia patients across

TABLE 5-8
COMPARISON OF LOW VS. HIGH OUTLIER-REGRESSION COST HOSPITALS AMONG UNDER-50 BED RURAL HOSPITALS BY STATE IN PPS5

UNDER-50 BED, RURAL

AAI86	MNAME	HBEDS	MEDICARE AVERAGE COST	MEDICARE ANCILLARY COST	MEDICARE ROUTINE COST	MEDICARE ICU COST	MEDICARE CMI	MEDICARE CMI-ADJ LOS	PPS MARGIN	TOTAL MARGIN	OCC	MEDICARE ADMISS PERCENT	HCFA HOURLY WAGE RATE	CMI-ADJ DISCHARGE PER NURSE	FTES OER OCCUPIED BED
STATE = Georgia															
RCOSTGROUP = LOW															
1379	CHATTOOGA COUNTY	21	1755	610	1211	0	0.93	8.64	0.21	-0.01	0.67	0.55	7.70	33.56	3.92
1408	MORGAN MEMORIAL	26	2281	1115	1309	0	0.87	4.17	0.04	-0.04	0.27	0.39	10.15	78.83	4.52
1412	PATTERSON	40	2105	1014	1226	0	1.03	6.68	0.12	0.13	0.8	0.36	6.24	52.91	2.95
1421	MILLER COUNTY	38	1905	889	1200	0	1.00	4.2	0.27	0.06	0.75	0.43	7.95	44.7	2.36
1425	EARLY MEMORIAL	49	2087	960	1304	0	0.96	5.75	0.1	0.07	0.83	0.38	7.87	54.92	3.12
RCOSTGROUP = HIGH															
1461	BLECKLEY MEMORIAL	45	3294	1445	1655	448	1.00	5.44	-0.34	-0.1	0.29	0.47	9.85	45.71	5.4
STATE = Indiana															
RCOSTGROUP = LOW															
1964	BLACKFORD COUNTY	47	2162	848	1447	0	1.05	5.99	0	0.14	0.49	0.42	8.68	43.42	5.57
RCOSTGROUP = HIGH															
1961	WOODLAWN	49	3258	1595	1652	405	1.10	6.03	-0.24	0	0.65	0.32	10.72	42.68	5.5
STATE = Kansas															
COSTGROUP = LOW															
2164	ANDERSON COUNTY	34	1850	854	772	0	1.01	4.02	0.17	-0.01	0.7	0.5	9.14	45.56	3.07
2198	MERCY	21	1463	484	869	0	0.97	5.92	0.37	0.08	0.18	0.44	7.84	77.74	5.46
2265	HOLTON CITY	26	2043	549	1579	0	0.97	7.22	-0.21	-0.07	0.38	0.45	9.01	37.2	3.76
RCOSTGROUP = HIGH															
2172	DECHAIRO	20	3591	1315	2499	0	1.15	7.15	-0.08	-0.04	0.36	0.77	10.74	31.94	2.91
2189	CHEYENNE COUNTY	23	3608	1536	2310	0	1.05	6.41	-0.39	-0.17	0.26	0.58	7.68	27.56	5.07
2195	EDWARDS COUNTY	49	3244	859	2659	0	0.96	7.98	-0.21	-0.17	0.31	0.61	9.03	18.46	4.42
2201	HAMILTON COUNTY	29	4155	1153	3235	0	0.92	8.15	-0.57	-0.33	0.59	0.44	8.53	8.5	5.37
2206	SCOTT COUNTY	27	3453	1725	2016	0	1.00	8.43	-0.13	-0.03	0.41	0.48	9.07	30.61	6.05
2215	COFFEY COUNTY	26	3555	2094	1924	0	1.01	5.87	-0.47	0.15	0.23	0.58	10.87	25.75	10.69
2220	WASHINGTON CNTY, DIST 1	18	3451	1162	2390	0	1.06	10.73	-0.06	-0.06	0.56	0.56	7.43	49.29	4.09
2228	LANE COUNTY	10	3019	1397	1750	0	1.01	5.6	-0.07	0.03	0.74	0.63	7.80	19.73	4.08
2230	BOB WILSON MEM GRANT CNT	41	4213	1676	2120	696	0.95	8.7	-0.55	-0.21	0.27	0.33	9.60	32.75	5.98

TABLE 5-8 (Cont.)

UNDER-50 BED, RURAL

AAI86	MNAME	HBEDS	MEDICARE AVERAGE COST	MEDICARE ANCILLARY COST	MEDICARE ROUTINE COST	MEDICARE ICU COST	MEDICARE CMI	MEDICARE CMI-ADJ LOS	PPS MARGIN	TOTAL MARGIN	OCC	MEDICARE ADMISS PERCENT	HCFA HOURLY WAGE RATE	CMI-ADJ DISCHARGE PER NURSE	FTES OER OCCUPIED BED
STATE = MISSISSIPPI															
RCOSTGROUP = LOW															
3243	PEARL RIVER COUNTY	20	1892	772	1183	0	0.92	7.29	0.19	-0.52	0.81	0.56	8.26	53.89	4.77
3266	CHOCTAW COUNTY	28	1982	543	1584	0	0.91	9.33	0.23	0.06	0.85	0.38	7.29	48.99	2.87
3270	KILMICHAEL	19	2035	691	1486	0	0.89	8.19	0.2	0.01	0.63	0.61	7.65	50.76	4
3310	DISTRICT TWO COMM	29	1611	647	1077	0	0.93	11.93	0.23	0.05	0.52	0.66	6.60	62.53	2.93
RCOSTGROUP = HIGH															
3237	COMM HOSP OF CALHOUN CO	49	4264	1912	4328	0	0.90	5.85	-0.48	--	0.08	0.39	7.46	36.69	8.81
3239	JASPER GENERAL	49	4242	1372	3079	0	1.01	11.74	-0.73	-0.06	0.65	0.58	7.72	22.08	2.24
3281	CLAIBORNE COUNTY	32	3277	1421	2209	0	0.93	6.71	-0.31	-0.14	0.28	0.3	8.49	64.09	6.3
STATE = North Dakota															
RCOSTGROUP = LOW															
4357	CARRINGTON HEALTH CENTE	30	2093	1035	1470	0	0.95	5.05	0.23	0.24	0.71	0.41	10.13	60.83	3.21
4389	JACOBSON MEM HOSP CARE C	25	1876	917	1195	0	0.94	5.82	0.31	0.15	0.62	0.74	7.65	48.08	2.68
4399	LINTON	25	2117	889	1384	0	1.00	5.94	0.2	0.22	0.24	0.54	7.23	34.17	7.93
RCOSTGROUP = HIGH															
4371	ST LUKE'S TRI-STATE	39	3069	1436	1816	0	0.97	5.97	-0.16	0.02	0.28	0.59	9.28	47.57	4.14
4391	UNITY	48	3327	1341	1965	249	1.02	10.73	-0.19	0.3	0.41	0.36	10.07	32.77	3.08
STATE = Oklahoma															
RCOSTGROUP = LOW															
4658	WEWOKA MEMORIAL	28	1819	677	1180	0	0.97	4.34	0.29	-0.01	0.29	0.39	7.61	54.82	6.96
4678	PUSHMATAHA COUNTY	48	2382	1074	1752	0	1.05	6.67	0.17	-0.03	0.47	0.41	9.10	53.3	4.42
4697	HARPER COUNTY COMM	25	2557	781	1914	0	1.05	7.49	0.07	-0.07	0.39	0.35	8.71	33.5	4.93
4725	HEALDTON MUNICIPAL	28	1699	673	1136	0	1.01	5.09	0.31	0.15	0.25	0.41	7.95	57.76	5.56
4733	COMMUNITY HOSPITAL-LAKE	33	1809	932	1088	0	1.07	5.26	0.35	0.14	0.42	0.6	9.07	62.88	3.64
RCOSTGROUP = HIGH															
4654	LINDSAY MUNICIPAL	25	3673	1762	2067	0	1.02	6.75	-0.17	-0.19	0.36	0.52	10.02	43.54	6.64
4699	ALFALFA COUNTY	20	4180	1475	3020	0	1.01	6.74	-0.73	-0.21	0.2	0.57	10.20	29.91	7.67
4715	PERRY MEMORIAL	28	3738	1680	2876	0	1.05	5.47	-0.06	0.16	0.36	0.43	8.78	35.17	4.71
4716	CLEVELAND AREA	25	4234	1730	2622	0	0.99	6.67	-0.44	-0.08	0.28	0.67	10.37	16.77	7.59

TABLE 5-9
COMPARISON OF LOW VS. HIGH OUTLIER-REGRESSSION COST HOSPITALS AMONG UNDER-100 BED URBAN HOSPITALS BY STATE IN PPS5

UNDER-100 BED, URBAN

STATE = Alabama

RCOSTGROUP = LOW

AAI86	MNAME	HBEDS	MEDICARE AVERAGE COST	MEDICARE ANCILLARY COST	MEDICARE ROUTINE COST	MEDICARE ICU COST	MEDICARE CMI	MEDICARE CMI-ADJ LOS	PPS MARGIN	TOTAL MARGIN	OCC	MEDICARE ADMISS PERCENT	HCFA HOURLY WAGE RATE	DISCHARGE PER NURSE	OER OCCUPIED BED
0017	PIEDMONT	47	2376	1184	1473	0	1.10	7.14	0.12	-0.04	0.72	0.54	10.61	33.89	2.29

RCOSTGROUP = HIGH

0102	DOCTORS HOSPITAL OF MOBI	99	5254	2465	2039	783	1.17	6.66	-0.6	-0.54	0.28	0.59	13.94	23.52	7.34

STATE = Maine

RCOSTGROUP = LOW

2591	REGIONAL MEMORIAL	90	2142	758	1290	269	1.16	5.91	0.22	0.07	0.49	0.42	11.94	32.1	4.71

RCOSTGROUP = HIGH

2560	MILLINOCKET REGIONAL	50	4008	1587	2378	415	1.05	8.07	-0.45	0.01	0.46	0.32	11.02	42.8	7.44
2563	NORTHERN CUMBERLAND ME	40	3856	1402	1958	714	1.07	8.53	-0.34	-0.03	0.67	0.47	10.89	22.53	6.28

STATE = South Carolina

RCOSTGROUP = LOW

5133	MEMORIAL	56	2388	1132	1633	392	1.13	6.55	0.15	0.06	0.63	0.49	10.44	33.17	3.45
5150	DIVINE SAVIOUR	51	2330	1026	1707	0	1.00	9.3	0.06	-0.1	0.7	0.44	9.62	32.58	2.09

RCOSTGROUP = HIGH

5154	HILLCREST	56	3720	1563	1722	917	1.24	6.62	-0.1	-0.07	0.38	0.39	13.60	36.83	4.81
5198	BAKER	60	3950	1877	1887	480	1.18	10.15	-0.07	0.05	0.57	0.37	10.95	33.2	5.4

TABLE 5–9 (Cont.)

UNDER–100 BED, URBAN

AAI86	MNAME	HBEDS	MEDICARE AVERAGE COST	MEDICARE ANCILLARY COST	MEDICARE ROUTINE COST	MEDICARE ICU COST	MEDICARE CMI	MEDICARE CMI–ADJ LOS	PPS MARGIN	TOTAL MARGIN	OCC	MEDICARE ADMISS PERCENT	HCFA HOURLY WAGE RATE	CMI–ADJ DISCHARGE PER NURSE	FTES OER OCCUPIED BED
STATE = Texas															
RCOSTGROUP = LOW															
5446	JOHNS COMMUNITY	65	2344	1002	1275	218	1.12	8.06	0.22	0.06	0.48	0.5	10.32	40.49	3.66
5469	DOLLY VINSANT MEMORIAL	63	2273	1082	1302	0	1.15	5.63	0.18	–0.04	0.48	0.36	9.56	54.18	4.44
5515	GUADALUPE VALLEY	71	2315	1152	890	422	1.16	5.15	0.26	0.07	0.65	0.35	10.25	48.98	5.94
5523	GLADEWATER MUNICIPAL	54	2248	985	1133	321	1.14	4.85	0.08	–0.03	0.39	0.59	9.80	49.43	2.24
5555	METROPLEX	78	2200	1150	1028	284	1.30	4.95	0.23	0.01	0.51	0.24	11.82	47.1	4.59
5574	VALLER COMMUNITY	50	2162	1045	1157	156	1.12	6.01	0.15	0.04	0.54	0.23	10.08	65.81	4.45
5584	GEORGETOWN	66	2109	907	1198	177	1.26	4.94	0.29	0.01	0.42	0.3	10.85	63.65	4.39
5594	CAMPBELL MEMORIAL	97	2670	1506	947	334	1.18	6.17	0.11	0.08	0.52	0.28	11.03	52.4	4.79
5619	CORYELL MEMORIAL	48	1916	1051	955	203	1.15	5.05	0.28	0.02	0.35	0.42	7.76	44.59	7.31
5704	DOCTORS MEMORIAL	46	2163	1060	1178	0	1.10	6.15	0.19	–0.09	0.39	0.41	8.59	63.11	3.86
5705	DAYLOR MEDICAL CENTER AT	68	2404	1327	1118	288	1.28	4.16	0.23	0.04	0.6	0.47	12.56	66.05	2.76
5729	YETTIE KERSTING MEMORIAL	42	1550	559	1113	0	0.95	3.44	0.25	–0.21	0.23	0.42	10.06	47.73	6.01
5735	SAN JACINTO METHODIST	97	3095	1399	1278	498	1.14	7.15	0.05	–0.05	0.47	0.37	13.54	36.48	9.64
5764	ROY H LAIRD MEMORIAL	60	2367	1135	1380	64	1.10	4.79	0.06	–0.15	0.36	0.43	10.10	51.41	5.67
5800	SILSBEE DOCTORS	59	2343	906	2179	0	1.03	6.01	0.05	–0.11	0.41	0.45	11.63	55.21	4.44
5864	PALO DURO	49	2125	1338	968	0	1.02	4.89	0.22	–0.02	0.47	0.24	10.37	41.25	4.8
5902	MEDICAL ARTS	71	2169	1521	999	0	1.22	4.34	0.31	0.18	0.48	0.06	14.46	73.58	3.89
RCOSTGRP = HIGH															
5485	GASTON EPISCOPAL	84	4732	3089	2252	520	1.45	6.82	–0.27	–0.3	0.36	0.41	11.29	64.48	3.36
5817	GRANVILLE C MORTON	37	5015	2722	2544	0	0.90	6.45	–0.61	–0.03	0.38	0.27	12.60	27.47	2.73
5852	DOCTORS	96	3931	2314	1502	621	1.21	5.82	–0.27	0.43	0.46	0.39		50.77	3.66
5856	DOCTORS HOSPITAL OF LARE	95	4743	2435	2426	598	1.10	7.43	–0.21	–0.05	0.52	0.21	12.69	45.62	4.66

TABLE 5-10
COMPARISON OF LOW VS. HIGH OUTLIER-REGRESSION COST HOSPITALS AMONG OVER-400 BED URBAN HOSPITALS BY STATE IN PPS5

OVER-400 BED, URBAN

STATE = California

COSTGROUP = LOW

AAI86	MNAME	HBEDS	MEDICARE AVERAGE COST	MEDICARE ANCILLARY COST	MEDICARE ROUTINE COST	MEDICARE ICU COST	MEDICARE CMI	MEDICARE CMI-ADJ LOS	PPS MARGIN	TOTAL MARGIN	OCC	MEDICARE ADMISS PERCENT	HCFA HOURLY WAGE RATE	CMI-ADJ DISCHARGE PER NURSE	FTES OER OCCUPIED BED
632	LAC USC MEDICAL CENTER	1256	3731	1524	2020	432	1.15	6.99	0.37	-0.03	0.9	0.02	17.10	42.57	7.2
696	UNIV OF CALIF SAN FRANCISC	509	3826	2169	1639	377	1.67	5.28	0.17	0.04	0.72	0.25	19.93	30.23	5.15

RCOSTGROUP = HIGH

573	ST JOHN'S HOSP & HLTH CEN	438	4418	2329	1591	520	1.38	6	-0.26	-0.04	0.54	0.37	18.24	52.27	5.65
813	CEDARS-SINAI MEDICAL CENT	839	4919	2978	1791	557	1.40	6.29	-0.38	0.05	0.69	0.31	18.78	47.26	6.19

STATE = Florida

RCOSTGROUP = LOW

1074	UNIVERSITY	414	3594	2180	1531	558	1.35	7.08	0.16	0.02	0.73	0.13	13.34	48.14	5.19
1122	WINTER HAVEN	479	2650	1341	1069	378	1.28	5.41	0.09	0.02	0.75	0.44	10.68	33.19	3.68
1190	TALLAHASSEE MEM REG MED	603	2610	1402	1142	319	1.47	4.88	0.15	0.72	0.78	0.27	12.94	62.33	2.96

RCOSTGROUP = HIGH

1106	MOUNT SINAI MEDICAL CENTE	679	4060	2379	1700	633	1.39	7.25	-0.08	--	0.56	0.39	13.66	49.06	4.93
1134	ST ANTHONY'S	407	4010	2057	1872	447	1.29	7.87	-0.22	0.04	0.58	0.57	11.55	36.95	4.47
1206	SOUTH MIAMI	489	4094	2413	1479	366	1.40	6.69	-0.29	0.03	0.65	0.22	14.23	58.87	3.53

TABLE 5–11
COMPARISON OF LOW VS. HIGH OUTLIER–REGRESSION COST HOSPITALS AMONG MINOR/MAJOR TEACHING HOSPITALS BY STATE IN PPS5

MINOR TEACHING

STATE = Connecticut

RCOSTGROUP = LOW

AAI86	MNAME	HBEDS	MEDICARE AVERAGE COST	MEDICARE ANCILLARY COST	MEDICARE ROUTINE COST	MEDICARE ICU COST	MEDICARE CMI	MEDICARE CMI–ADJ LOS	PPS MARGIN	TOTAL MARGIN	OCC	MEDICARE ADMISS PERCENT	HCFA HOURLY WAGE RATE	CMI–ADJ DISCHARGE PER NURSE	FTES OER OCCUPIED BED
1001	HOSPITAL OF SAINT RAPHAEL	439	2890	1614	1490	178	1.71	6.19	0.17	0.02	0.87	0.35	16.39	44.84	3.52

STATE = Missouri

RCOSTGROUP = LOW

3365	DEACONESS	423	2368	1117	1190	307	1.28	6.42	0.21	0.03	0.62	0.41	12.69	37	6.09

RCOSTGROUP = HIGH

3371	RESEARCH MEDICAL CENTER	474	3958	2320	1347	610	1.36	6.68	–0.1	0.08	0.64	0.34	13.69	54.12	4.7

MAJOR TEACHING

STATE = Minnesota

RCOSTGROUP = LOW

3138	ST PAUL–RAMSEY MEDICAL C	288	3158	1707	1270	977	1.28	5.61	0.19	0.07	0.75	0.22	17.20	43.87	6.23

RCOSTGROUP = HIGH

3087	UNIV OF MINN HOSP & CLINIC	477	5039	2999	2033	760	1.55	5.43	–0.03	0	0.75	0.26	15.35	19.68	7.05

STATE = Missouri

RCOSTGROUP = LOW

3434	TRUMAN MEDICAL CENTER–E	44	2398	1045	1180	0	1.11	6.25	0.4	–0.06	0.91	0.13	14.33	36.93	10.73
3388	TRUMAN MEDICAL CENTER–W	269	1535	821	785	175	1.18	3.95	0.31	–0.02	0.83	0.29	12.32	65.54	4.71
3375	JEWISH HOSPITAL OF ST LOUI	397	3511	2048	1441	720	1.47	6.3	0.14	0.01	0.72	0.39	13.76	33.61	6.64

RCOSTGROUP = HIGH

3464	UNIVERSITY HOSPITALS & CLI	371	4551	3087	1366	934	1.70	6.24	0.14	0.04	0.69	0.19	12.83	42.84	6.08

the two facilities, it is difficult to say which hospital is more "efficient." Certainly the one without the ICU is lower cost, but is it truly more efficient?

Higher average wages go along with a more complex service mix. At Woodlawn, the average hourly wage, according to its response to the 1988 HCFA wage survey, was $10.72. Blackford County's average wage was $8.68, or 20 percent less. Thus, even though the number of FTEs per occupied bed is identical in the two facilities, labor costs are 20 percent higher at Woodlawn. Under PPS, both hospitals have the same HCFA wage index adjustment (=.78), and Woodlawn receives no extra payments for its more expensive labor. Its KMI is 5 points higher which covers some, but not all, of this wage discrepancy.

Among under-100 bed urban hospitals in Texas (see Table 5-9), Yettie Kersting Memorial in the town of Liberty is a 42-bed facility, only 23 percent occupied, that shows average Medicare costs of only $1,550 vs. $5,015 for Granville Morton Hospital in Dallas, a 37-bed facility that is 38 percent occupied. Despite having only 37 beds, Granville Morton offers many high-tech services not offerred by Yettie Kersting, including radiation therapy, radioactive implants, therapeutic radioisotope, a histopathology lab, a blood bank, and hemodialysis. The depth and costliness of these services is not reflected in the hospital's Medicare casemix, which is 5 points less than Yettie Kersting. As Liberty is the only hospital in its county (between Houston and Beaumont), it may serve a different, referral, role than Granville Morton, which is trying to compete with other Dallas hospitals for more complicated patients. Consistent with its broader scope of services, Granville Morton reported an averge hourly wage of $12.60 vs. $10.06 in Yettie Kersting. After adjusting for the higher HCFA wage index for Kersting (.98 vs. .93 in Dallas), the effective wage different is 32 percent (=($12.60/$10.06)*(.98/.93)).

A comparison of these hospitals raises two interesting questions. First, do the costs of similar Medicare patients in the two facilities reflect widely varying types of services? Second, does the remarkably broad scope of services at the small Granville Morton hospital require significantly higher fixed overhead and nursing inputs?

Among over-400-bed urban hospitals, the LA County Medical Center is exceptional (see Table 5-10). It is the teaching hospital for the University of Southern California and has 1,256 beds. Yet, it is very low cost for a large, urban, major teaching, hospital. It is over 90 percent occupied; yet only 2 percent of its admissions were covered by Medicare in PPS5. Compare it with Cedars-Sinai across town in Beverly Hills, which was only 69 percent occupied but derived 37 percent of its admissions from Medicare and had CMI-adjusted total costs that are one-third higher and nearly double the ancillary costs. (LA County actually shows higher routine nursing costs per discharge.) The standard productivity measures do not explain LAC's lower costs. LAC's averge wages are 15 percent lower, but they exmploy more staff. A comparison of services offerred shows Cedars-Sinai providing three services not provided in LAC: Magnetic Resonance Imaging, inpatient rehab, and lithotripsy. What LAC is paying for labor and how intensively it is treating its patients may reflect an "efficient" as opposed to "Cadillac" care. But what does it mean to have only 2 percent Medicare?

A less extreme comparison is between the 479-bed Winter Haven Hospital in Florida with 489-bed South Miami Hospital. South Miami shows (CMI and wage-adjusted) Medicare costs of $4,094 vs. only $2,650 for Winter Haven. South Miami has a long Medicare CMI-adjusted length of stay which explains its higher routine costs, but its ancillary costs are more than double those incurred by Winter Haven patients. South Miami's average hourly wage ($14.23) is 33 percent higher than Winter Haven's, but its HCFA wage index explains 25 points of the difference. A comparison of service mix shows Winter Haven with an emphasis on long-term and psychiatric care while South Miami offers several high-tech services not found in Winter Haven, including open heart surgery, organ transplant, inpatient rehab, and a neonatal ICU. It is possible that the casemix index is not accurately reflecting the true patient severity and cost differences between these facilities. It is also possible that patients in South Miami are treated more intensively for the same illnesses.

Turning to major teaching hospitals, compare the Jewish Hospital of St. Louis, a low-cost, 397-bed facility with the University Hospitals and Clinics in Columbia, Missouri. University Hospitals has a much higher casemix index; yet its CMI-adjusted costs are still a thousand dollars higher because of higher ancillary and ICU costs. Jewish Hospital's low

nurse productivity statistics do not explain its lower costs. In terms of service mix, Jewish Hospital offers several services not provided by Univerity Hospitals, including a hospice and geriatric services, and psychiatric, alcohol and drug outpatient services. University Hospitals has a dedicated cardiac ICU, a trauma center, and organ transplant services not offerred by Jewish Hospital. Interestingly, this is one case where the PPS margins of a low and high-cost facility are equal and positive, implying that teaching and other add-ons at University are covering its higher costs. Nevertheless, there may be a difference in clinical treatment patterns or a patient focus that distinguishes the two facilities. Jewish Hospital may emphasize the less acutely ill elderly while University Hospitals is emphasizing very high-tech medicine such as transplants and trauma. Why the Medicare CMI would not reflect this casemix difference is unknown.

We also compared Truman Medical Center-West in Kansas City, Missouri, with the University Hospitals in Columbia. Truman is only 269 beds but exhibits extremely low adjusted Medicare costs per discharge, $1,535 vs. $3,511 at Jewish and $4,551 at University. Although both Jewish and University have significant obstetrics services (i.e., 2,000 and 1,800 births in PPS5, respectively), the Truman Medical Center is a baby hospital to a much greater degree. It had 10 births per acute bed vs. 4-4.5 per bed in the other two facilities. It also had a very short Medicare CMI-adjusted length of stay (less than 4 days) for a major teaching hospital. Its service mix was very narrow compared to University. Truman-West did not offer a cardiac ICU, open heart surgery, radiation or radioisotope therapy, redioactive implants, or any psychiatric services. It is tempting to hypothesize that the narrow scope of services at Truman enables them to provide very efficient care for the patients they do treat.

5.11 Why are Low Cost Hospitals so Underutilized?

Efficiency is invariably associated with high utilization rates. Firms operating at 80-90 percent capacity are considered efficient by intensively utilizing their fixed resources. Why, then, are low cost hospitals so underutilized while high cost hospitals have higher occupancy rates (see Table 5-3)? The answer has to do with an inconsistency in denominators.

Occupancy rates can be considered a fair measure of bed use, although it is by no means perfect because of differences in licensed vs. staffed beds. A hospital could have a high occupancy rate for beds staffed and in use but a low one with all licensed beds are counted. Occupancy rates do not perfectly measure the intensity with which quasi-fixed nursing inputs are used either. But, for all its shortcomings, it is one dimension of efficiency. It is defined, however, as total inpatient days per period divided by total bed-days available.

Average costs, and profits, on the other hand, are generally measured in terms of admissions or discharges, i.e., cost or profit per case. It is possible to have high occupancy rates either because of (a) a high turnover rate in patients per bed, or (b) long lengths of stay:

$$\text{Occupancy Rate} = (1/365)*LOS*(DIS/BED)$$

where

LOS = average length of stay; and

DIS/BED = discharges divided by beds.

Average costs, by contrast, can be expressed as a weighted sum of FTEs and BEDS per discharge; the weights equal to factor prices. Thus, average costs are an inverse function of the bed turnover rate and, unlike occupancy rates, bear no direct relation to lengths of stay.

Table 5-12 provides summary statistics on actual and adjusted occupancy rates and actual vs. predicted lengths of stay, stratified by regression-outlier cost group and selected size and location groupings. Adjusted occupancy rates are based on the formula:

$$\text{Adjusted OCCUPANCY} = (LOS_* / LOS)*\text{OCCUPANCY}$$

where LOS_* = predicted length of stay based on a linear regression of hospital average length of stay on the Medicare casemix index. If a hospital's actual occupancy rate is 10 percent below that predicted by its casemix index, its adjusted occupancy rate would be 10 percent lower as well. This approach assumes that deviations from predicted lengths of stay among the elderly are consistent for the under-65 in the same hospital.

TABLE 5-12
IMPACT OF ADJUSTING OCCUPANCY RATES FOR UNPREDICTABLY LONG AVERAGE LENGTHS OF STAY

	REGRESSION OUTLIER COST GROUP		
	LOW	MIDDLE	HIGH
	RURAL, UNDER 50 BEDS		
OCCUPANCY	50.8%	45.2%	37.2%
ADJUSTED OCCUPANCY	62.6%	50.8%	36.9%
MEDICARE LENGTH OF STAY	5.56	6.32	7.06
MEDICARE PREDICTED LOS	6.55	6.64	6.62
	RURAL, OVER 169 BEDS		
OCCUPANCY	73.0%	61.7%	61.3%
ADJUSTED OCCUPANCY	72.6%	57.9%	54.3%
MEDICARE LENGTH OF STAY	7.60	7.99	8.44
MEDICARE PREDICTED LOS	7.85	7.44	7.66
	URBAN, UNDER 100 BEDS		
OCCUPANCY	49.3%	46.4%	49.1%
ADJUSTED OCCUPANCY	59.5%	51.9%	43.6%
MEDICARE LENGTH OF STAY	5.90	6.72	7.97
MEDICARE PREDICTED LOS	6.95	7.06	7.16
	URBAN, OVER 504 BEDS		
OCCUPANCY	76.2%	73.6%	74.5%
ADJUSTED OCCUPANCY	76.7%	70.5%	64.1%
MEDICARE LENGTH OF STAY	8.65	9.27	9.77
MEDICARE PREDICTED LOS	8.63	8.78	8.34

Notes: (1) Predicted length of stay based on regression of actual Medicare length of stay on Medicare Casemix index.
(2) Adjusted occupancy rate = actual rate times the ratio of predicted to actual length of stay.

Source: Calculations based on AHA Hospital Statistics data tapes for hospital fiscal year in PPS5.

Among rural hospitals unadjusted occupancy rates are in the expected direction with respect to average cost, but are nearly identical across urban hospitals. Predicted vs. actual lengths of stay are inversely related to costliness, however. Low cost, rural, hospitals under 50 beds, for example, have predicted lengths of stay (6.55 days) that are 18 percent higher than their actual values while high cost hospitals have predicted lengths of stay that are 6 percent lower. The result of the adjustment is to widen further the observed "occupancy gap". On a comparable length of stay basis, low cost rural, under-50 bed, hospitals had an occupancy rate of 62.5 percent in PPS5 vs. only 36.9 percent in the high cost group. This is a 25 percentage point gap compared to only 15 points in the unadjusted data.

The effects of the length of stay adjustment is more profound among urban hospitals. Whereas no difference in occupancy rates is observed among under-100 bed urban hospitals, adjusting for length of stay produces a 15 point gap. That is, from the standpoint of costliness per discharge, high cost small urban hospitals are far less efficient in using their fixed resources than low cost facilities. The same trend holds for very large urban hospitals. Long stays and artificially high occupancy rates remain a vestige of cost-basd reimbursement in some facilities, producing a false sense of efficiency.

The answer to the question of why low cost hospitals seem so underutilized is that they aren't. It is only an artifact of there relatively short stays given their casemix severity. A more meaningful measure of capacity utilization would be the bed turnover rate, DIS/BED, multiplied by the Medicare casemix index. For under 50-bed rural hospitals exhibiting low costs, the rate would be 35 discharges per bed vs. only 20 per bed in high cost hospitals. For under-100 bed urban low cost hospitals, the rate is somewhat lower, 31 discharges per bed, but still well above the high cost hospitals (22 per bed) of similar size and location.

6.0 CONCLUSIONS

6.1 The Competitive Solution

In a normal competitive market, consumer sovereignty dictates the products that are produced. Consumers' varied tastes induce suppliers to differentiate their products to fulfill market niches, resulting in millions of product varieties. Consumers also face full market prices for each product and service and must weigh quantity, quality, and variety against the going market price. A novel variety may find little market as consumers are unwilling to pay extra for a perceived variation in the basic product.

Suppliers compete vigorously on both price and nonprice dimensions, constantly improving the product, raising productivity, lowering price, and trying to gain market share. Experiments with new varieties can increase market share and profits as well as producers satisfy unfilled consumer desires. In static equilibrium, the market's invisible hand sets each consumer's marginal valuation of product quantity and variety equal to the going market price which simultaneously reflects producers' marginal costs. In dynamic equilibrium, the market sets the right signals for new product development resulting in the optimal rate of new product variety.

The hospital industry exhibits three market flaws that frustrate the invisible hand of competition. Health insurance has lowered the net price of hospital care by over 90% on average with most Americans paying nothing for their hospitalizations. Artificially low prices at point-of-service anesthetize consumers to price differences across institutions. Providers have little incentive to control costs in order to offer more competitive prices to users because consumers do not shop around for hospital care. Negligible price sensitivity has also supported an explosion of service variety in the form of high-tech diagnostic and therapeutic services, private rooms, primary (RN) care nursing, luxurious hospital lobbies, and other amenities. Insurers before 1980 were no more price sensitive than consumers in paying hospitals primarily on costs or "discounted" charges. Insurer-agents are beginning to "shop around" and negotiate reduced rates on behalf of subscribers, but this activity is isolated geographically to HMO-intensive cities.

A second flaw stems from the fact that the industry is dominated by nonprofit providers. As profit targetters instead of maximizers, private voluntary and public hospitals do not constantly seek to minimize costs either in producing intermediate services such as CT scans or in the bundling of services in caring for patients. Pursuing other goals (e.g., prestige, sales growth, high-tech services), nonprofits plow back accumulated profits into the institution until the desired target profit is achieved. They also provide free or subsidized care to groups deemed deserving by the board of directors. Staff physicians play the dominating role in such a noncost minimizing environment, treating the hospital as their workshops while bearing little of the facility's costs.

And third, consumers are uncertain or ignorant of both the true probabilities of being hospitalized due to illness or accident and of the most appropriate diagnostic and therapeutic modes of care once admitted. These decisions are delegated to physician agents in charge of their care. With little concern over patient out-of-pocket costs, physicians naturally follow their own treatment recommendations which, too, are often ill-informed and suboptimal. Arrow's (1963) admonition that physicians act as society's agents and sublimate their bias towards overconsumption of health services is naive and probably illegal in today's litigious world.

6.2 Medicare PPS: Supplanting the Market

In 1983, the single largest hospital insurer, Medicare, with over 30% of the business, switched from cost-based to prospective payment. By aggregating bills into DRGs and establishing average payment rates per discharge, Medicare effectively bundled care into discrete packets. If the flawed market could not establish correct prices, the government felt responsible to supplant the market and reinstitute price and cost competition. Shleifer (1985) has called this "yardstick competition" wherein the regulator uses the costs of comparable hospitals to infer a single provider's attainable cost level.

The new DRG-based prospective payment program had decidedly positive effects in shortening stays, shifting unnecessary care to the ambulatory setting, and supporting management's attempts to introduce more clinical and organizational efficiency. Unfortunately, these gains proved to be short run. Since 1985, the program must be

considered a failure in controlling intensity of care, raising productivity, and limiting cost increases. While many reasons can be cited, the continuing price insensitivity of Medicare and most other patients is at the heart of the problem. Faced with unprecedented declines in inpatient volume in 1984-85, that have continued to a lesser degree ever since, hospitals turned, not to cost, but to service competition as the way to regain market share and cover their high (and rising) average fixed costs. Yes, they could "compete" on costs by better managing patients clinically and by producing services with fewer inputs, but any profits from "getting under" DRG rates were eroded by declining admissions and rapidly rising average fixed costs. With huge overhead costs to cover, market share became the name of the game. Opening new services, hiring physician specialists, renovating buildings, purchasing prestigious, high-tech equipment; these formed the competitive strategies of many hospitals, large and small, urban as well as rural. Better management also cost money as more, better trained, managers had to be hired and the moribund quality assurance unit of the hospital needed serious upgrading.

6.3 Implications for PPS Updates

What relevance does this prologue have in assessing PPS updates? Consider the standard update methodology as proposed by either HCFA or ProPAC. First, the market basket of input prices are trended forward. Then any allowance for service intensity and cost-inducing technologies is added. Finally, a debit is recommended for improved productivity. As short-run productivity and intensity gains faded after 1985, long-run nonprice competition re-established the secular growth in intensity and turned productivity gains negative once again. PPS margins were similarly affected. After initially high margins from short-run clinical and organizational improvements, margins have fallen rapidly and consistently for nearly all hospitals in rural and urban areas. Declining PPS margins led the Congress, under industry pressure, to enact higher updates in the PPS standardized amounts--particularly for rural hospitals. Just as the Administration and the Congress could point to extraordinary PPS profits to justify "market basket minus" updates early on, the industry could use declining and negative margins to demand higher updates to cover Medicare's "fair share" of costs.

Federal policy makers have taken two alternative approaches to setting PPS updates, one inductive, another deductive. ProPAC has commissioned inductive studies of the cumulative effects of new technologies and productivity gains on costs. Industry-specific trends in intensity and productivity support a quantitative recommendation of what the update should be to cover new costs after properly adjusted to reflect realized productivity in producing intermediate services. The Congress, supported by ProPAC and the Administration, has also deduced from extraordinary PPS margins that the industry does not need substantial updates to pay for input price and intensity increases. These approaches are not mutually exclusive. Recommended updates based on the HCFA market basket, intensity, and productivity trends have been adjusted for industry financial performance. Of late, negative PPS margins have been interpreted as a sign of inadequate government spending on hospitals.

6.4 Flaws in Measuring Costs and PPS Margins

Serious flaws exist in attempting to measure the costliness of new technologies or in drawing correct policy conclusions from PPS profit rates. ProPAC estimates of the costs of new technologies fail to account for the diffusion of old technologies into new DRGs, ignore the complementarity of procedures like angioplasty and bypass surgery, and lack any debit in base period costs for obsolete technologies. As a result, their estimates grossly understate the cost impact of technology innovation and diffusion.

Many problems arise when evaluating PPS margins. For one, the shift of care to the outpatient department results in a similar shift in allocated costs. This artificially raises PPS profits as most of the costs are still being incurred in the outpatient department. For another, Medicare full-cost accounting reallocates average instead of lower marginal costs to other payers when Medicare volumes decline. This overstates the true marginal profitability of Medicare stays when length of stay is falling rapidly (as in 1983-85) and artificially accentuates the rate of decline in PPS profits.

Total patient margins are a better performance measure because they avoid these inter-payer cost allocation problems, but they suffer from serious limitations of their own. Hospitals can hide revenues by perpetually overestimating discounts and disallowances from

third party payers. Accountants can engage in "off-balance-sheet" transactions that transfer accumulated profits to holding companies. This gives the impression that the industry has fewer financial reserves to draw on to fund negative PPS margins.

Besides measurement problems, the overall meaning of either PPS or total patient margins for hospital financial performance and requirements is questionable. As "nonprofit" institutions, cash flow, not accumulated equity, is critical. So long as reimbursement includes a substantial allowance for depreciation, hospitals can continue to reconstitute themselves regardless whether the industry is overcapitalized and needs downsizing. Large teaching and public hospitals consistently run negative patient margins yet most enjoy positive cashflows and total margins. As profit targetters, hospitals will adjust their charge schedules and budgetting to drive down excess profit rates to a level consistent with their cash flow objectives.

And to the extent hospitals engage in third degree price discrimination, treating similar patients while receiving widely different reimbursement, the independent meaning of "PPS margins", as distinct from total margins, disappears. Incurring "negative" PPS margins may be the "price" hospitals are more than willing to pay to keep average fixed costs low and profits from higher paying private patients high. Hospital financial managers pay less attention to PPS margins than one might expect, despite their public protestations, because most costs are fixed and, thus, shared jointly by all patients. Medicare margins are less because the government is willing and able to exert some of its market power to set all-or-nothing DRG rates. Private insurers are either unwilling or unable to be so price sensitive because of their small market share. For this reason, the criticism that Medicare does not pay its "fair share" is misplaced. Healthy total margins in a clearly oversized industry suggest that private payers pay too much and should be negotiating better deals. Failure to do so should not be re-interpreted as the government's failure to pay its share of costs. If PPS updates were dramatically increased, private prices would not decrease very much by price discriminating hospitals. As profit targetters, the extra money would go primarily for more inputs, more services, and higher wages.

What could suffer from continually low updates would be the amount of free care. As profit targetters, some hospitals are willing to provide free care so long as total margins

remain at or above their target levels. If PPS margins became too negative, free care would be curtailed. This has already happened implicitly by the conversion of some public hospitals to private hands. But because uncompensated care is so unequally distributed even among major teaching facilities, special add-ons and PPS updates for teaching and rural hospitals are poorly targetted, and much of the additional money does not go to improved access for the uninsured.

6.5 The Efficiency and Equity of PPS Yardstick Competition

How efficient and equitable has PPS yardstick competition been after eight years? Efficiency and equity criteria require that the probability of being a losing hospital with negative PPS margins be correlated with efficiency indicators and uncorrelated with any other hospital characteristic unrelated to efficiency. The probability of being a loser is certainly nonrandom. Fully one-half of the hospitals in the bottom quarter of PPS margins (or one-eighth of all hospitals in a given year) consistently remain at the bottom over at least three years (and probably longer). If annual profitability were strictly random, one-in-64 would be consistent losers.

6.5.1 Who Wins? Who Loses?

Consistently losing hospitals are much more likely to be under-50 bed rural, sole community, and disproportionate share, hospitals. Consistently winning hospitals tend to be over-400 bed urban or teaching institutions. Our analysis has shown that consistent PPS losers have experienced 20% declines in inpatient volume vs. just 5% declines among winners; report average casemix and wage-adjusted Medicare costs per case of $4,000 in PPS5 vs. $3,000 among winners; experienced double the cost inflation of winners; had a 16% decline in nursing productivity; and increased FTE employees slightly in spite of a 20% drop in inpatient volume.

For yardstick competition to work, price setters must remain firm on updates as hospital profits diverge and the inefficient fail. Fixed prospective rates have led to a growing divergence in PPS margins. Winners in the top quarter maintained 18% PPS margins through PPS5, down only slightly from PPS1. Losing hospitals, on the other hand, saw +5% PPS

margins in PPS1 turn into -27% margins by PPS5. Mergers and closings accelerated after 1983 as profit variability grew, but through 1989 only 355 hospitals (roughly 7 percent of the total) closed; most of them small rural and urban facilities with nearby providers. Considering the 14% drop in admissions and 18% decline in average daily census among short-term hospitals, the roughly 20,000 beds taken out of service by these closures (out of 900,000) is trivial.

6.5.2 The Performance of "Efficient" Hospitals

But are the "right" hospitals closing? Are they the high cost, inefficient, redundant facilities? If PPS margins are a flawed measure of performance, either for individual providers or for the industry as a whole, then what is happening to efficient hospitals? Indeed, can a reference set of efficient hospitals be identified and then used by policy makers to set future PPS updates?

The production-cost dualism permits two approaches to these questions. The productivity approach relates outputs to inputs, either in ratio form or through econometric estimation of production functions. The cost approach relates costs to outputs using ratios or cost functions, holding casemix and area input prices constant. Both methods suffer in their lack of valuation of health status. Consequently, any intensity increases on a per discharge basis in either approach are interpreted as declines in efficiency, holding DRG casemix constant. With this caveat in mind, we determined the per case costliness of hospitals and used labor productivity indicators inter alia to verify and better understand why some hospitals were consistently low or high cost.

Two approaches to measuring costliness were explored. The first is called adjusted costs and involves dividing reported total or Medicare inpatient costs by the Medicare casemix index and the HCFA wage index, the latter weighted by 0.70 to reflect the average proportion of costs that are labor-related. The second, modified peer group, approach involves an analysis-of-variance regression of adjusted costs on several hospital characteristics including urban-rural location, bedsize, Census Division, and teaching status. The residual from the regression was then used to classify hospitals into those whose actual costs were consistently

above (positive residual) or below (negative) predicted amounts. This method is roughly equivalent to a peer group approach wherein each hospital's own costs are compared, not with the nation as a whole, but with hospitals having similar characteristics, e.g., under-100 bed urban nonteaching hospitals in the Pacific Division.

The two approaches, as expected, generate a very different set of hospitals. The simpler, adjusted cost, group is composed of about 90% under-50 bed rural and under 100-bed urban hospitals. Less than 3% are teaching facilities with residents. This is true even after adjusting for casemix and wages in the local area. These hospitals average 59 beds vs. 233 beds among high cost facilities. Their Medicare length of stay, again casemix-adjusted, is 1-1.5 days shorter, and they operate at only 50% bed capacity. Even with low occupancy, their nursing productivity per discharge is 10-20% higher. These low cost facilities do very well under PPS with 90% showing positive PPS margins (average = 14% in PPS5) despite enjoying almost no add-ons for Indirect Medical Education or disproportionate share and outlier patients. A defining service characteristic of the group is their limited use of Intensive Care Units.

Low cost hospitals based on peer group regression are very different. They are much larger on average, with 134 beds, 23% are teaching, their Medicare casemix index = 1.16 vs. 1.07 for the adjusted cost group, and their occupancy rate is 5 percentage points higher. Although regression low cost outliers incur roughly 20% higher costs than the adjusted cost group, their PPS margins averaged over 16% in PPS5. In spite of much higher CMI-adjusted ancillary and ICU costs per Medicare discharge, they have even shorter stays than the first low cost group and exhibit similar nurse and FTE productivity.

Hospitals appear as regression low cost outliers for many legitimate reasons, although some cases are inexplicable and suggest the possibility of reporting error. Many low cost hospitals offer fewer services for their bedsize: no open heart surgery, radiation therapy, blood bank, or physical therapy. Low cost small rural hospitals likely are without an ICU which adds materially to costs. Especially low cost hospitals, large and small, appear to have a narrow service focus, on "Centers of Excellence" in the current parlance. Some are "baby hospitals" that see a few Medicare patients and incur minimal ancillary costs and discharge patients quickly. Others are podiatric, eye, or other specialty hospitals whose costs are far less

than implied by the DRG relative weights. Still others have a geriatric and/or psychiatric emphasis with fewer high-tech ancillary services. A cursory examination of wage rates suggests that some facilities do better by paying less than the average hospital wage in their area. University-based medical school hospitals appear especially expensive compared to other major teaching facilities not directly affiliated with a university.

6.6 Caveats in Using a Reference Set of Efficient Hospitals

Analysis supports the notion that low cost hospitals are generally more efficient and may be used as a benchmark for setting PPS updates. Yet, care must be taken in defining and using such a reference group. In any single year, a certain percentage of hospitals will always be "low cost" relative to others. If efficient behavior is stable and ingrained in the clinical and organizational management of patients, this should consistently produce low costs over time. Many hospitals, either accidently or through poor data reporting, could show low cost in a particular year that in no way indicates an efficient mode of practice.

It would seem a mistake, however, to simply choose, say, the bottom 25% of consistently low cost hospitals regardless of bedsize, location, or teaching status. Such a group is extremely skewed to smaller institutions mostly in rural areas. To assert that such a group is efficient is to implicitly argue that patients in this group receive the same quality of care and enjoy the same outcomes as a similar group of patients seen in other hospitals. Without rigorous evidence, it would be difficult to defend this assumption in public debates.

Selecting a regression-adjusted reference set of low cost hospitals would have the strong advantage of being "representative" of small and large, north, east, south, and west, and teaching and nonteaching hospitals. The set could be made large enough to allow for the law of large numbers to randomize hospitals with respect to other characteristics. A set of consistent low cost facilities defined over at least three years (possibly on rolling inclusion basis) is preferred in order to avoid random, one time, reporting errors, wide swings in utilization and costs, etc. As a group, if not each and every member, the reference set would

be highly defensible on efficiency grounds in terms of length of stay, average costs and cost inflation, occupancy rate, nursing productivity, service mix, and wages.

Because individual members would certainly be open to quality and data reporting criticisms, it would be a mistake to identify each member as an "efficient" hospital. Rather, the group as a statistical composite should be emphasized. HCFA could reasonably assert that it has identified a group of efficient low cost hospitals, controlling for generally recognized cost-influencing characteristics, that can be used as a performance yardstick for all other hospitals.

6.7 How to Use Efficient Hospitals to Set PPS Updates

How could the reference set of low cost hospitals be used to update PPS rates? From a static perspective, PPS updates could be based on the PPS margins of the low cost group. Running at +16% in PPS5, updates for these facilities could be minimal for several years without any negative financial implications. If a rolling sample was used, it would be possible to maintain low updates even further into the future as inefficiencies are squeezed out of the system.

How high an annual update to set depends on (a) the rate of cost increase within the group, (b) the ultimate target PPS margin (possibly zero) chosen by policy makers, and (c) the desired rate of convergence on the target. All differential updates by hospital location or other characteristic would be eliminated. HCFA could argue that rural hospitals do not need special updates because the reference group contains many small rural facilities already doing well under PPS. The consequences of a single, low update could be offset in extraordinary circumstances by a short-run formulary volume adjustment. If a hospital's overall discharges fell by over 5% in any year, Medicare payments could be increased next year (and only next year) by 2.5%.

From a dynamic perspective, the PPS update could be tied to the reference set's rate of cost increase. Over the PPS3-5 period, the regression low cost group experienced 7% annual Medicare cost inflation, which is well below the industry average but also well above the HCFA market basket. The low cost group is engaged in nonprice competition like other

hospitals, although possibly not to the same degree, and its annual inflation may not be an objective indicator of optimal intensity growth. Furthermore, it seems unreasonable to permit such high updates at least until PPS margins reached the desired target level for this efficient group. At that point, the Federal government would be faced with the same problem that state hospital rate setting systems have faced for many years; namely, what is the desired long-run growth in hospital intensity. Usually, New York and other systems set a 1-2% annual allowance above input cost inflation. In 5-10 years this may be affordable if health care cost inflation in other medical services is brought under control as well.

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